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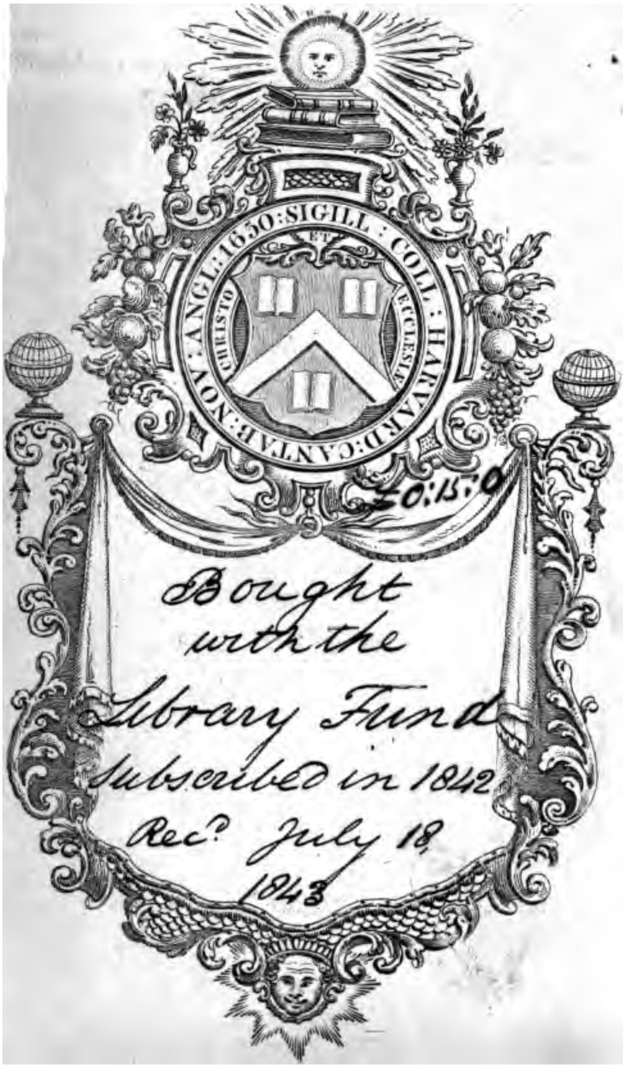
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AN

INQUIRY

INTO THE

OPINIONS, ANCIENT AND MODERN,

CONCERNING

LIFE AND ORGANIZATION.

BY

JOHN BARCLAY, M.D.

LECTURER ON ANATOMY AND SURGERY; FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS; HONORARY FELLOW OF THE ROYAL COLLEGE OF SURGEONS; FELLOW OF THE ROYAL SOCIETY, AND OF THE WERNERIAN NATURAL HISTORY SOCIETY OF EDINBURGH; FELLOW OF THE LINNEAN SOCIETY, &c. &c.

> *Των καλων και τιμιων την ειδησιν ὑπολαμβανοντες, μαλλον δ'ἑτεραν ἑτερας η κατα ακριβειαν, η τῳ βελτιονων τε και θαυμασιωτερων ειναι, δι' αμφοτερα ταυτα την περι ψυχης ἱστοριαν ευλογως αν εν πρωτοις τιθειημεν.*
>
> ARISTOTELES *de Anima*, lib. i. cap. 1.

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TO

THOMAS THOMSON, M.D.

PROFESSOR OF CHEMISTRY IN THE UNIVERSITY OF GLASGOW,

FELLOW OF

THE ROYAL SOCIETIES OF LONDON AND EDINBURGH,

&c. &c.

MY DEAR SIR,

Independently of our long intimacy and friendship, a motive of rather a different kind suggests the propriety of dedicating the following INQUIRY to you. Since the days of Paracelsus, much has been ascribed to chemical affinities as the causes of organization and life. The arguments, indeed, in support of that hypothesis, are easily confuted; but as some trust to names more than to arguments, I have given your sentiments and those of Chaptal upon this subject, that the chemico-physiologist may ponder them in his mind, before he presume to trouble the world with any attempt to explain these phenomena, either by the chemical affinities that are known, or by any supposed chemical affinities in the least incompatible with those which are known. With much esteem, I remain,

MY DEAR SIR,

Yours truly.

JOHN BARCLAY.

PREFACE.

In studying the phenomena of animals and vegetables, the diligent inquirer must readily perceive the wide difference between their structures and those of the most regularly formed minerals. In all such structures he cannot help observing a diversity of organs, arranged and proportioned on a definite plan, mutually dependent, mutually subservient, and all co-operating for mutual preservation. In examining them minutely, he must also acknowledge a species of mechanism, of which the most ingenious mechanic can form no adequate conception; and besides this mechanism, a great variety of chemical combinations, that not only indicate a species of chemistry unknown to man, but which evidently imply a species of chemists whose modes of operation are equally beyond his powers to imitate and his powers to comprehend.

From observing such appearances, it is not surprising that the cause or causes of these phenomena should so often have attracted the attention of the curious, and that philosophers in all ages should have regarded them as subjects of much interest and importance. "If," says Aristotle, "the knowledge of things becoming and honourable be deservedly held in high estimation, and if there be any species of knowledge more exquisite than another, either upon account of its accuracy, or of the objects to which it relates being more excellent or more wonderful, we should not hesitate to pronounce the history of the animating principle as justly entitled to hold the first rank." This acute philosopher evidently saw that the effects of what he supposed an animating principle, are those alone which distinguish the organisms of plants and animals from all the other structures of matter; and that such a principle, being that which constitutes their distinctive characters, ought to be the first object of attention with the physiologist. As, however, those effects which he has ascribed to an animating principle have also been ascribed to causes of a very different nature, the question comes to be, What are the causes of organization and the other concomitant phenomena of life? Some have imagined that these may originate in certain unknown properties of the atoms of which organized structures are composed. On this hypothesis human existence terminates with death, schemes of expediency and self-interest take place of religious and moral obligations, and thoughts and actions however criminal are, like Spartan thefts, to be held disgraceful only if detected. From the same hypothesis it follows as a corollary, that if atoms can construct a human organism, and exhibit the phenomena of a human soul, they may, when collected in greater numbers, produce a deity[a]; and thus if a deity be thought necessary to account for the various phenomena of the universe, he must be subjected to matter and motion, and to the eternal and immutable laws of fate and necessity, in such a way that if he owe not any thing to man, neither can man owe any thing to him[b]. Respecting the grounds of these speculations, it must be obvious that it is not the physiologist alone who is here concerned: all must feel equally interested to know what is the cause of their origin, what is the nature of their existence, and whether in likelihood it is to be confined to this world, or extended to another.

---

[a] See below, page 141.

[b] "Consultons l'expérience, contemplons l'univers; il ne nous offre que de la matière et du mouvement.

"Si Dieu ne doit rien aux hommes, ceux-ci ne lui doivent rien." *Le Vrai Sens du Système de la Nature,* ch. i. xix. See also below, p. 412, note [f].

On deliberately examining an animal structure in connexion with its functions, reflecting on its singular and astonishing mechanism, how food and drink are converted into blood, and blood into such a diversity of organs, by chemical processes different in kind, and differently conducted, from any that are known, what are we to think? Can such a mechanism be the cause of feeling, reasoning, and reflection? or can chemical affinities, without a chemist of uncommon resources, and of extraordinary art and intelligence, produce such a structure? Some think that they may, and others think not. This difference of opinion was what suggested the following Inquiry; the object of which is to collect and to state the arguments on both sides, to examine the legitimacy and force of these arguments as they occur, and after the Inquirer has given his opinion, to leave the reader to judge for himself.

As young men, entering on the studies of anatomy and chemistry, are naturally led to investigate the causes of organization, and are frequently apt to form hypotheses on grounds of information not the most ample, it was imagined that such an inquiry might be particularly useful to them.

By making them acquainted with what ingenious and learned men have written on the subject, it may probably tend to moderate the rash excesses of vanity, and prevent them from betraying their ignorance to the world, by publishing as new, opinions which have repeatedly been published before, have repeatedly been obsolete, been repeatedly revived, and repeatedly become obsolete again: for the flights of fancy, though numerous and extensive in range and variety, are not so unlimited as many have supposed, if we may be allowed to take the hypotheses concerning the causes of organization as the criterion. On this subject, few original opinions or arguments upon either side have been advanced since the days of Lucretius, or even of Aristotle. The novelties which have been since introduced are found to be chiefly novelties of expression, not novelties of ideas; accompanied, it is true, with certain characteristics of manner, and also with attempts at additional illustration from the views of the microscope and the visions of some pretenders to chemistry. The impelling motives, the leading opinions, and the leading arguments have however suffered scarcely any change, and appear at this day to be generically and specifically the same that they were several centuries ago.

Of the truth of this assertion, the reader will probably be fully convinced on perusing the pages of the following Inquiry. It consists of four chapters, each divided into sections: the first chapter contains an account of the philosophical and popular opinions entertained by the ancients concerning the nature and the variety of animating causes, an account also of the principal arguments which they employed to prove that these causes originate in matter: the second, an account of some very general and vague terms of no precise application or meaning, but which frequently and almost unavoidably occur in all physiological investigations: the third, an account of the opinions entertained by those modern physiologists who are either disposed to ascribe the whole phenomena of life, or at least organization, sensation, and instinct, to the powers of mechanism and the effects of chemical affinities: the fourth, an account of the opinions of some distinguished ancients and moderns, who have ascribed organization and all the other vital phenomena to an internal animating principle.

As the authors who have written upon these subjects are extremely numerous, while their leading opinions as well as their arguments are comparatively few, it has not been thought necessary to mention all who have laboured in this field of inquiry, but out of the number whose writings have been perused by the author, to select those who have been the first, or among the first, to suggest the opinions, or who have acquired the highest reputation in supporting them with the greatest ingenuity or learning. Even among these there will be found frequent repetitions of the same ideas, of the same expressions, and the same modified views of the subject. That all who are noticed might be fairly represented, in quoting their sentiments the edition and page or chapter and section of their works are referred to in the notes; or in cases where their writings are rare, of difficult access, or the passages striking, the originals are subjoined.

If several well known and distinguished works upon physiology have been passed unnoted, the reason has been, that they treat of animal and vegetable structures only after they are formed; and although the experiments which they detail have been highly useful, and have contributed much to illustrate the functions, connexions, and sympathies of the organs composing such structures, yet they furnish no answer to the leading question of the Inquiry, How came these structures to be organized, and to exhibit such astonishing phenomena?

It only remains for the author to add, that in revising the proof sheets, he has been highly indebted to two of his friends; to David Irving, LL. D. the learned author of the Memoirs of Buchanan, and to Ninian Little, Esq. The former of these gentlemen having been appointed to the office of Keeper of the Advocates Library, an office successively filled by Ruddiman, Hume, and Ferguson, and his time from that period being much less at his own disposal, Mr. Little very kindly and politely undertook the task which the Doctor had begun; and it is owing to their minute accuracy and unremitting attention, that many errors have been corrected, which would otherwise have escaped the author's observation.

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ERRATA.

Page 39, line 25, *for* have *read* has
Page 90, line 30, *for* extensive *read* general
Page 152, line 12, *for* in *read* by
Page 239, line 10, *for* some *read* by some
Page 413, line 22, for *Complettes* read *Complètes*
Page 432, last line, read *De Partibus Animalium*, lib. iv. cap. 12. Opera, tom. i. p. 1042.

N. B.—The *Système de la Nature* mentioned in page 412, (note [f]) is not the *Système de la Nature* of Maupertuis, mentioned in page 248.

AN

INQUIRY

CONCERNING

LIFE AND ORGANIZATION.

CHAPTER I.

SECTION I.

THREE STATES OF AN ORGANIZED BODY.

In all languages there are certain terms for expressing two remarkable states of the organized body, the *living* and the *dead;* and these states are so well marked, that, in most cases, they are easily distinguished even by the lower animals.

In the living state, the body is observed to receive aliment; to assimilate a part; to evacuate what is redundant or useless; to repair the daily waste of its organs; to unite parts that are separated by violence; to contract certain habits of acting; to vary these habits according to circumstances; to reject what is noxious; to select what is salutary; and not only to employ a variety of means for its own preservation, but likewise to adopt most effectual measures for the permanent continuance of its species.

In the dead state all is apparently without motion. No agent within indicates design, intelligence, or foresight: there is no respiration; no digestion, circulation, or nutrition; no reparation of waste or of injuries; no perception; no sensation; no irritability; no power to preserve from decay. The whole fabric dries up, or becomes putrid; and, in both cases, sooner or later, equally tends to a dissolution.

A middle state, in which plants and animals are occasionally found, and their seeds and eggs very generally found, has been called the *torpid.* In this state there is a partial or total suspension of all the obvious functions of life. But as that appearance does not, like the dead state, arise from any injury or derangement of the system, but from some change or some deficiency in those kinds of auxiliary agents that are necessary to the free exercise of their powers, every part is found ready to resume its operations as soon as the auxiliary agents are restored.

With the exception of sleep and torpor, which differ from each other in degree, none of the intermediate stages between life and death has yet, in our language, been distinguished by a name; mankind, in general, amidst their social intercourse, being merely furnished with expressions to denote what is striking, of deep interest, or of frequent occurrence. The living state, which to a reflecting mind appears the most singular of all, has particularly excited the attention of philosophers in every age, and has led them to form various hypotheses concerning the immediate cause or causes by which it is produced. From the earliest dawn, therefore, of inquiry, it has frequently exercised the ingenuity of the moralist, the divine, and the metaphysican; while the surgeon and physician, who have attended to the animal economy, and observed the changes which intense thought, continued study, and all the depressing and exhilarating passions produce in the system, should also have been induced to inquire into a cause which, by general consent, has so much power either to assist or oppose their endeavours in attempting a cure. And, indeed, the view which anatomists give of a regularly formed organized structure would be very incomplete, if they showed it only in the dead state, and were not to advert to those more interesting phenomena that distinguish it when living.

In tracing these phenomena, however, to their causes, we shall doubtless meet with difficulties, and perhaps with not a few that are insurmountable by human efforts. Yet this prospect need not deter us from making the attempt: much useful information may be obtained, if we can discover the nature of the difficulties, and clearly demonstrate what is within and what is beyond the reach of our powers. The man who pretends to explain every thing in the animal economy, must not only be ignorant of his subject, but of himself. I have no such pretensions: my design is merely to state the opinions which ingenious men, in different countries, and at different periods, have been led to entertain concerning the nature of these phenomena; to state as clearly and forcibly as I can the several arguments on which they are founded; to make some remarks as I proceed; and to draw the conclusion that appears most consonant to established facts, to guarded experience, and to impartial observation.

SECTION II.

A SUMMARY VIEW OF DIFFERENT OPINIONS ENTERTAINED BY THE ANCIENTS CONCERNING THE CAUSE OF THE VITAL PHENOMENA.

The Greeks, in general, ascribed these phenomena to what, in their language, is termed *psyche*[a], in Latin *anima*, and in ours the soul, or the vital principle. Their opinions, however, concerning the soul were extremely various. According to Nemesius, who has collected a considerable number of their hypotheses, Democritus, Epicurus, and the whole of the Stoics, thought it was corporeal, but differed widely as to its substance; the Stoics maintaining that it was an air warm and ignited[b]; Hippo, the philosopher, that it was water; Democritus, that it was fire, asserting

[a] Ψυχη.

[b] Πνευμα ενθερμον και διαπυρον.

Nec calor est quisquam cui non sit mixtus et aer.

Lucretius, iii. 235.

that the globular forms of his atoms, on being incorporated, produced heat and life; Heraclitus, that as the soul of the universe was a vapour or exhalation from the moist elements[c], so the souls of animals were vapours or exhalations from their own bodies, or from without.

Of those who believed the soul to be incorporeal, some asserted that it was a substance, and immortal, while others believed that it was neither. Thales was the first who maintained that it was always in motion, and itself the origin of that motion; Pythagoras, in the language of allegory, that it was a self-moving monad or number; Plato, a substance conceivable only by the understanding, and moving according to harmony and number; Aristotle that it was the first *entelecheia*[d], or, as

---

[c] Αναθυμιασις εκ των ὑγρων.

[d] Εντελεχεια. Nemesius, in supposing that Aristotle did not attach the notion of a substance to the word εντελεχεια, has drawn his conclusion from that logical and abstract definition which he has given in the first chapter of his second book concerning the soul (Opera Omnia, tom. i. p. 630, edit. Du Val. Paris. 1629, 2 tom. fol.); but he should have recollected, that this definition is, in the very next chapter, followed by a physical definition, and that there is a difference between a logical and a physical definition. For, observes Aristotle, διαφεροντως δ᾽ αν ὁρισαιντο ὁ φυσικος τε και διαλεκτικος. (Ibid. p. 618.) In calling the soul an entelecheia, both Cicero and Lucretius obviously appear to have understood him as speaking of a fifth essence, or a quintum genus, a fifth element, distinct from any of the other four; an element of which the soul is composed, but an element, at the same time, without a name, a vacans nomine, in the language of Cicero (Quæst. Tuscul. lib. i. § 10.) or a nominis ex-

Wither expresses it, "the first continuall-motion of a bodie-naturall, having in it those instrumentall parts, wherein was possibility of life[e];" Dinarchus[f], a harmony of heat, cold, moisture, and dryness: all of them, excepting Aristotle and Dinarchus, agreeing in this, that the soul is a substance. Others imagined that there is but one universal soul, which emanates or is distributed in portions to all bodies, animate or inanimate. Such was the doctrine of the Manicheans. Others, again, taught that there is one universal soul, and, at the same time, many different species. Plato, who believed in the existence of a universal soul,

---

pers, in that of Lucretius (lib. iii. v. 243. 280.) It seems, however, to be generally agreed, that Aristotle uses the word entelecheia to express logically what he meant by the soul. "Le celebre Hermolaus Barbarus l'exprima en Latin mot à mot par *perfectihabia*, car l'acte est un accomplissement de la puissance: et il n'avoit point besoin de consulter le diable, comme il a fait, à ce qu'on dit, pour n'apprendre que cela." (Leibnitz, *Theodicée*, p. 131. Amst. 1720, 12mo.)

[e] The Nature of Man: a learned and usefull Tract written in Greek by Nemesius, &c. Englished by Geo: Wither. Lond. 1636, 12mo.

Life, as the cause of the vital phenomena, is expressed in Greek by the term ψυχη; as an effect of that cause, by the term ζωη. In English, the same word answers for both, which is often the source of much ambiguity. The Greeks were, in this instance, superior to us, not only in accuracy of expression, but distinctness of conception.

[f] Dinarchus is supposed to be a typographical error for Dicæarchus. After several researches into various authors, the Oxford editor adds, "Inde adducar ut credam, facili lapsu Dinarchum pro Dicæarcho interpolatum."

supposed that all things lived by its influence; but that those only were living creatures which had separate souls[g].

Nemesius has remarked, that the Greek philosophers who believed in the immortality of the soul, generally believed in its transmigration[h]. Those who believed in only one species, as the rational soul[i], made it pass indiscriminately into the bodies of plants and animals; some according to certain stated periods[k]; some as it happened[l]. Others, again, had two species[m], the rational and irrational; and a third set as many species as there are species of organized structures[n]. Jamblichus, who was of this last opinion, always confined his transmigration of souls to structures of the same species; observing that every species of soul had a species of structure exactly suited to its own faculties, and to the faculties of no other species. Hence the organs of the body were, in his opinion, always adapted, in variety and number, to the faculties of the soul of which they were the instruments[o]. Plato distinguished these faculties into three classes, the vegetative, sensitive, and rational; and, assigning a separate residence to each, placed the first in the belly, the second in the chest, and the third in the head[p].

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[g] Ζην μεν παντα, μη ειναι δε παντα ζωα.

[h] Μετενσωματωσις.

[i] Ειδος το λογικον.

[k] Κατα τινας ρητας χρονων περιοδους.

[l] Ὡς ετυχεν.

[m] The ειδος λογικον, and the ειδος αλογον.

[n] Ψυχων τοσαυτα ὁσα των ζωων τα ειδη.

[o] Ἑκαστη γαρ ψυχικη δυναμει προς την ενεργειαν ιδια μερη του σωματος αποκεκληρωται.

---

[p] Nemesius de Natura Hominis, p. 38. edit. Oxon. 1671, 8vo. A less detailed and accurate account of the several opinions entertained by the ancients concerning the soul is given by Marcus, in the first book of the Tusculan questions. Some, he says, thought that it perished with the body; some that it lasted a long time after; and others, again, that it lasted for ever. "Alii statim dissipari, alii diu permanere, alii semper." Some imagined that it was the head; some the heart; some a certain part of the brain; some that these were its places of residence; while others believed that it was the breath; Zeno, the Stoic, that it was fire; Empedocles, blood suffused in the heart; Aristoxenus, the philosopher and musician, that it was harmony; Xenocrates, like Pythagoras, that it was a number; Dicæarchus, that it was nothing but a name denoting a state or temperament of the body; Aristotle, that it was a continued and perpetual motion; Plato, that it was threefold, having reason in the head, rage in the breast, and desire in the region under the præcordia; "Plato triplicem finxit animam, cujus principatum, id est rationem, in capite sicut in arce posuit, et duas partes separare voluit, iram et cupiditatem, quas locis disclusit; iram in pectore, cupiditatem subter præcordia locavit." (Ciceronis *Tuscul. Quæst.* lib. i. § 9. 10.) With respect to the various opinions which the ancients entertained concerning the soul, consult likewise Aristotle *De Anima,* lib. i. cap. ii. p. 618. In imitation of Plato, Galen had also three faculties, a ruling, rational, or animal one for the head; a vital one for the thorax, and one that he called natural for the belly; and to these he gave for instruments or organs three spirits, the animal, vital, and natural, which were certain vaporous exhalations from the blood. Those who have not access to the original may find these doctrines accurately stated in Le Clerc's *Histoire de la Medicine,* p. 677. edit. Haye, 1729, 4to.

Agreeably to this hypothesis of Galen, the organs were classed in many of the older systems of anatomy as belonging to one or other of the three faculties. But Galen had, besides, subordinate faculties that presided over particular organs, which Harvey has

SECTION III.

DIFFERENT SOULS AND DIFFERENT BODIES IN THE SAME PERSON.

THE practice of arranging these logical entities, the[q] *dynameis*, *vires*, *faculties*, or *functions*, into different classes, and ascribing them to different species of souls, had begun to be prevalent at an early period, not only among philosophers, but likewise among poets. Empedocles gave a rational and a sentient soul to every animal; the rational one derived from the gods, and the sentient originating in the four elements. The ancients generally reserved the rational for man[r]. In Homer's, as well as in Empedocles's time, the soul was divided into two spe-

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denominated *sensus proprii,* and which Blumenbach has since raised to the dignity of *vitæ propriæ.*

These distinctions being more of a logical than physical nature, and deriving their origin rather from fancy than from observation, vary in number and also in kind with the taste, the humour, or the views of the person that happens to contrive them; and hence some physiologists have lately distributed all the organs of the body between animal and organic, or, as some choose to call it, automatic life; reserving, however, a discretionary power to transfer them from one life to another on any marked change in the nature of their services. This division is somewhat different, and yet is in many respects the same with that into voluntary and involuntary organs, or into animal and vegetable life. But a passion for novelty is satisfied even with the change of a name, though the meaning or substance may continue the same.

[q] Δυναμεις.

[r] Cudworthi Systema Intellectuale a Moshemio, tom. i. p. 46. tom. ii. p. 395.

cies, the *φρην*, and the *θυμος*, but afterwards, according to Diogenes Laertius, into three[s]. The body also was thought to be composed of three distinct species; of[t] a mortal, or crustaceous body, a[u] divine, etherial, or luciform body, appropriated to the *φρην*, and[x] an aerial, misty, or vaporous body, allotted to the *θυμος*[y]. Homer went so far as, after the dissolution of the mortal body, to separate entirely the *φρην* and *θυμος*, and to dispose of them in different places. He accordingly informs us, that the *φρην* of Hercules was feasting with the gods, and married to Hebe, at the very time that Ulysses was conversing with his *θυμος* in Hades[z]. The different souls, or the different bodies composing the person, were often supposed to exist separately.

It is still an article in many of the popular and vulgar creeds, that the ghost, or apparition is frequently seen near to the place where the gross or crustaceous body lies, either waiting till that body be interred, or till some crime be confessed or expiated. Nay, if we may rely on tradition, the spectral appearances of individuals have frequently been observed previously to their death; in which case they were usually distinguished in the old Scottish dialect by the term *wraiths*[a]. In the Greek, such spectres were named φαντασματα[b], πνευματα[c], ειδωλα, that is, apparitions, aerial forms, likenesses. In Latin, they were called *spectra*, *umbræ*, *simulacra*, *manes*, *imagines*, visions, shades, likenesses, ghosts, and images.

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[s] *Την δε ανθρωπου ψυχην διαιρεισθαι τριχη, εις τε νουν, και φρενας, και θυμον.* (Diogenes Laertius, p. 512. edit. Meibomii.)

[t] *Σωμα θνητον* or *οστρεωδες.*

[u] *Σωμα θεσπεσιον, αιθεριον,* or *αυγοειδες.*

[x] *Σωμα πνευματικον.*

[y] Cudworth's Intellectual System, p. 790-8. Lond. 1678, fol.

[z] *Τον δε μετ' εισενοησα βιην 'Ηρακληειην,*
Ειδωλον· αυτος δε μετ' αθανατοισι θεοισι
Τερπεται εν θαλιης, και εχει καλλισφυρον 'Ηβην.
Odyss. Λ. 600.

Ω ποποι, η ρα τις εστι και ειν αιδαο δομοισι
Ψυχη και ειδωλον, αταρ φρενες ουκ ενι παμπαν.
Iliad. Ψ. 104.

Some thought that they were souls visibly expanded; as Heraclitus, who said that life is a vapour, an αναθυμιασις, which, though meant literally by the philosopher, is employed by St. James as an apt similitude to point out the shortness and the uncertainty of human life. For what, says this apostle, is your life but a vapour, a mere ατμις, or, according to the modern version, a καπνος or smoke? Others were doubtful whether they were ψυχαι, the principles of life, or merely the vehicles of such principles[d]. The ghost of Hercules, which Ulysses saw in Hades, was, according to Homer, his ψυχη and ειδωλον, or his corporeal likeness, animated by his θυμος. Such simulacra were supposed to speak, to complain, to feel hunger, and receive nourishment; and therefore, when Ulysses sacrificed to the dead, ghosts of all descriptions flocked in great numbers around the trench where the smoking blood flowed, till, alarmed by their noise, he caused the victims to be burned, and their smoke to ascend; a proof, says the author of the life of Homer, that the poet was not ignorant of the fact, that the blood is the food and nourishment of the soul[e].

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[a] See Dr. Jamieson's Scottish Dictionary.

[b] Matth. 24, 26. [c] Luke 24, 37, 39.

[d] Το δε πνευμα εστιν αυτη ἡ ψυχη, η σχημα της ψυχης. (*Homeri Vita*: Galei Opuscula Mythologica, p. 341. edit. Amst. 1688, 8vo.)

To the Highlanders of Scotland, and also to the Romans[f], these simulacra occasionally appeared as if formed of clouds, or the mists of the hills. In latter times, when they were observed previously to death, they were generally so rarified as only to be seen by those endowed with the second sight. According to Virgil, these umbræ were the animæ or souls themselves; and whether of man, quadruped, fish, or bird, were all sprung from the same origin, as the soul of the universe from pure æther, or elemental fire; for,

> Inde hominum pecudumque genus, vitæque volantûm,
> Et quæ marmoreo fert monstra sub æquore pontus[g].

The umbræ, therefore, which Æneas saw, when he went to visit his father Anchises in the regions below, were ætherial souls, receiving rewards or suffering punishments for their past deeds; some for crimes that could never be expiated, and which rendered their punishments eternal[h]; others for crimes whose stains might be removed, and who were exposed, for a series of ages, to the action of air, water, or fire, until their original purity should be restored[i].

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[e] 'Oτι το αἱμα νομη και τροφη ἐστι του πνευματος. (*Opuscula Mythologica*, p. 341.)

[f] See Lucret. iv. 130, &c.

[g] Æn. vi. 728.

The poet Lucretius, although he admits the actual existence of these simulacra, is unwilling to believe that they are animated, or spirits returned from the regions of the dead; and therefore, to compose the minds of his friends that might be alarmed at their appearance, asserts they are mere pellicles, or membranes that are cast off from the surfaces of bodies, like old sloughs from grasshoppers or serpents[k]. Yet, in this language, it is clearly implied that the popular opinion which he is here endeavouring to confute, was that these simulacra were the souls of the dead, and that they had each a separate existence in a future state. For neither to Lucretius, nor to any one else in those days, does it seem to have occurred, that there was any incongruity or absurdity in supposing that a perfect system of organs, for reasoning, for thought, for speech, or for motion, could be formed out of fluids, such as air or vapour, or the flame of æther, the *aurai simplicis ignis.*

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[h] ————Sedet, æternumque sedebit
Infelix Theseus.
VIRGIL. Æn. vi. 617.

[i] ————Aliæ panduntur inanes
Suspensæ ad ventos: aliis sub gurgite vasto
Infectum eluitur scelus, aut exuritur igni—
Donec longa dies, perfecto temporis orbe,
Concretam exemit labem, purumque reliquit
Ætherium sensum, atque aurai simplicis ignem.
VIRGIL. Æn. vi. 740.

[k] Nunc agere incipiam tibi, quod vehementer ad has res
Adtinet, esse ea, quæ rerum simulacra vocamus;
Quæ, quasi membranæ summo de corpore rerum
Dereptæ, volitant ultro, citroque, per auras;
Atque eadem, nobis vigilantibus obvia, menteis

In most, if not in all of these simulacra, the dress and its fashions were represented as well as the body, while, in all the poetical regions of the dead, chariots, and various species of armour, were honoured likewise with their separate simulacra; so that these regions, as appears from the Odyssey, Æneid, and Edda, were just the simulacra of the manners, opinions, customs, and fashions that characterized the times and countries in which their poetical historians flourished.

> Terrificant, atque in somnis, cum sæpe figuras
> Contuimur miras, simulacraque luce carentum;
> Quæ nos horrifice, languenteis sæpe sopore,
> Excierunt: ne forte animas Acherunte reamur
> Ecfugere, aut umbras inter vivos volitare.---
> Dico igitur, rerum ecfigias tenueisque figuras
> Mittier ab rebus, summo de corpore, eorum
> Quæ quasi membranæ, vel cortex nominitanda est,
> Quod speciem ac formam similem gerit ejus imago,
> Quoiuscunque cluet de corpore fusa vagari.
>
> Lucretius, lib. iv. v. 33.

SECTION IV.

PRE-EXISTENCE OF SOULS.

Some notion of a future existence, however that notion may have been varied by peculiarity of observation, by modes of reasoning, habits of thinking, or other circumstances, seems, from the beginning of the human race, to have constantly followed them wherever they settled, and even to have sprung as it were spontaneously in every soul the least elevated above that of a brute. We can trace this opinion, says a celebrated writer, from one extremity of America to the other, in some regions more faint and obscure, in others more perfectly developed, but no where unknown. The most uncivilized of its savage tribes do not apprehend death as the extinction of being[1].

The idea, on the contrary, of a pre-existence, has been more limited, has been chiefly confined to contemplative minds engaged in philosophical research. It occurred to Plato, who supposed that the soul was different from the body, and that what have been called innate ideas are but the reminiscences of former impressions. It occurred to Pythagoras and the eastern sages, who believed in transmigration; and it occurred to all who believed that substantial entities are eternal, and that thought and sensation are not to be considered as the accidents of matter. From this enumeration, Democritus, Epicurus, the poet Lucretius, and all who followed their sect of philosophy, are necessarily excluded; for although they believed that the *anima* and *animus* were as much bodies, or parts of the body, as the hands and the feet, yet, from a persuasion that they were compounds, and dissoluble at death, they taught that their particles, when disorganized, returned to mingle with their primary elements; and therefore, as aggregates forming either an *anima* or *animus*, enjoyed no individual existence [m].

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[1] Robertson's Hist. of America, vol. ii. p. 201. "Nescio quo modo inhæret in mentibus quasi seculorum quoddam augurium futurorum, idque in maximis ingeniis altissimisque animis et existit maxime et apparet facillime." (Ciceronis *Tusc. Quæst.* lib. i. § 15.)

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[m] Primum, animum dico, mentem quem sæpe vocamus,
In quo consilium vitæ, regimenque, locatum est,
Esse hominis partem nihilo minus ac manus, et pes,
Atque oculei, partes animantis totius extant.
Quamvis multa quidem sapientum turba putarunt
Sensum animi certa non esse in parte locatum;
Verum habitum quemdam vitalem corporis esse,
Harmonian Graiei quam dicunt; qui faciat nos
Vivere cum sensu, nulla cum in parte siet mens.
LUCRET. iii. 94.

Nunc animum atque animam dico conjuncta teneri
Inter se, atque unam naturam confacere ex se.
LUCRET. iii. 137.

——Quoniam est animi natura reperta
Mobilis egregie, perquam constare necesse est
Corporibus parvis, et lævibus, atque rotundis.
LUCRET. iii. 204.

Atque animam, verbi causa, cum dicere pergam,
Mortalem esse docens, animum quoque dicere credas.
LUCRET. iii. 423.

This last opinion, that the materials of the soul are eternal, but the composition transient and temporary, is certainly inconsistent with the idea of a future state. But on what foundation does the opinion rest? One should imagine if the power that formed, or the will that designed, continued the same, the composition would be just as lasting as the materials. Now, who has demonstrated any alteration in the will or the power on which the composition of the aggregate depends? And yet the opinion of those who infer the mortality of the soul from its being a compound, is less absurd than that of some of our Christian divines, who infer immortality from its being a simple indivisible substance. According to their creed, if they reasoned consistently, the existence of the soul, whether simple or compound, should entirely depend on the will of that being who made it out of nothing, and who can preserve or annihilate it at his pleasure.

SECTION V.

FUTURE EXISTENCE.

As to the state of future existence, the opinions among the ancients were various. Some would

Ergo divisa est ea, quæ fuit una simul cum
Corpore: quapropter mortale utrumque putandum est;
In multas quoniam parteis disciditur æque.
LUCRET. iii. 667.

have the soul, after separation, to remain without a body; though, as that was a matter not easily conceived by ordinary minds[n], the generality, who thought of preserving it, allowed it a body, or at least some kind of figure or form. In this equipment some sent it to the clouds; some to the stars; some to happier regions above, warmed and illuminated by a different sun; some to regions in the east or the west; and some to regions in the bowels of the earth; while many chose to retain it on the surface, and to make it pass through numerous transmigrations into different bodies[n]. In these transmigrations, those who gave it an ethereal body kept it always united with that body before, and after, and during its union with the mortal body. Some gave it always a mortal body, making it to pass from one to another in uninterrupted succession. Some gave it the mortal body only at intervals. Some compelled it to enter into bodies of different species. Some, like Jamblichus, who believed in different species of souls, restricted each species to a particular species of body. Some considered the bodies as prisons, and the souls, while in them, as surrounded with darkness, and shut up in dungeons; *clausæ tenebris et carcere cæco.*

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[n] "Tenemusne quid animus sit? Si simplex, utrum sit ignis, an anima, an sanguis? An, ut Xenocrates, mens nullo corpore? Quod intelligi, quasi sit, vix potest." (Ciceronis *Lucullus*, § 39.) "Animos per se viventes non poterant mente complecti; formam aliquam figuramque quærebant. - - - - Magni autem est ingenii revocare mentem a sensibus, et cogitationem a consuetudine abducere." (*Tusc. Quæst.* lib. i. § 16.)

Others again represented the souls as remarkably anxious to enter and occupy these habitations; a notion that is treated not only with ridicule, but even with indelicacy by Lucretius[o]. But the creed alluded to is industriously exaggerated and caricatured; and of one of its modifications at least, a different account is given in the Æneid. As only few souls, according to Virgil, retained possession of the delightful plains of Elysium (*pauci læta arva tenemus* is the language of Anchises) the rest were returned into mortal bodies after a period of a thousand years, but before they revisited the upper regions, they were compelled to drink of Lethe, the river of forgetfulness, to excite and encourage their desire to return; this total oblivion of former impressions being thought necessary to prevent them from repining in their new habitations, and from anticipating to what extent their fiery energy and celestial origin[p] were to be again shackled and obscured[q], when encumbered with bodies that were noxious and vile, benumbed with joints that were made of earth, and surrounded with members that were constantly exciting the pains of sickness, or exhibiting the more horrible symptoms of death [r].

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[o] Denique connubia ad Veneris, partusque ferarum,
Esse animas præsto, deridiculum esse videtur;
Exspectare immortaleis mortalia membra
Innumero numero, certareque præproperanter
Inter se, quæ prima, potissimaque, insinuetur.
Lucret. iii. 777.

[p] Igneus est ollis vigor, et cœlestis origo.
Virgil. Æneid. vi. 730.

[q] Has omnes, ubi mille rotam volvere per annos,
Lethæum ad fluvium deus evocat agmine magno;
Scilicet immemores supera ut convexa revisant
Rursus, et incipiant in corpora velle reverti.
Æneid. vi. 748.

Were it not, however, for these transmigrations, the deity, observes the philosopher Sallust, would be under the necessity of creating a soul for every new body, so that in time the number would be infinite; and as what is infinite, in his mode of reasoning cannot be contained in a world that is finite, so transmigration became necessary, though, in these transmigrations, the rational souls never migrated into the bodies of irrational animals, but followed them without, as demons who possess or attend upon men [s].

Some who imagined that the soul might survive the body for a while, or *diu permanere*, might survive it long, yet supposed that at last, after wearing out a number of bodies, it might in time wear out itself, and perish for ever. Such were the various ideas of the ancients concerning the soul or the vital principle. And if some will deny its existence, upon the pretence that those who believe it are not fully agreed in their opinion; on the same pretence, were they consistent, they might also reject every branch of philosophy.

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[r] ———— Quantum non noxia corpora tardant,
Terrenique hebetant artus moribundaque membra.
Æneid. vi. 731.

[s] Εξωθεν ἐπονται ὡσπερ και ἡμιν οἱ ειληχοτες ἡμας δαιμονες. (Sallustius *De Diis et Mundo*, cap. xx. p. 278. apud Gale.)

SECTION VI.

VITAL PHENOMENA ASCRIBED EITHER TO A VITAL PRINCIPLE, OR TO A CERTAIN ORGANISM OF THE BODY.

Of all the opinions that have yet been enumerated respecting the cause of the vital phenomena, we have met with none in which they are not ultimately ascribed to one or other of two causes; to a certain organism of the materials of which the visible structure is composed, or to a principle totally distinct, which seems to have occurred to mankind in general, and to have received a distinct appellation in their several languages.

As these two ideas seem to pervade or intermingle with every discussion respecting the cause of the vital phenomena, it may not be improper, before entering on a more close and minute examination of the opinions of different authors, to inquire also how a species of organism came to be considered as a cause of these phenomena. A general view of the kinds of reasoning on which this notion is principally founded, may enable the reader to comprehend, with the greater facility, the nicer subtilties in the train of arguments by which it is supported. For as these arguments, under different management, must necessarily undergo a great variety of modifications, the reader who is not aware of their tendency, may not unfrequently be taken by surprise; may not so readily perceive, at a glance, the design of the author, nor so easily follow him through the intricate paths in which he is proceeding towards his conclusion.

SECTION VII.

OF ORGANISM AS THE CAUSE OF THE VITAL PHENOMENA.

The observations, reasonings, and habits, which have led to this opinion, are not only natural, say those who support it, but the conclusion is next to unavoidable. For to what, they say, to what do we owe the difference of sounds proceeding from the flute, the violin, and the harp, but to differences of structure? To what do we owe the difference of functions in the animal system, the difference, for instance of seeing, hearing, tasting, and smelling, but to differences of structure in those organs by which they are displayed? We can most readily excuse children, when they see a watch, for asking what kind of animal is in it; we can also excuse the untutored savage, in a state of nearly similar ignorance, when he ascribes unusual events to supernatural and invisible powers; and not only excuse but compassionate the vulgar and the superstitious, when they ascribe whatever is beyond their limited comprehension to the arts of the devil, the power of witchcraft, or the influence of good or of evil spirits. Such errors spring up, and must naturally spring up, in minds unacquainted with the powers of mechanism, the laws of nature, and the singular effects of chemical affinities. But what apology can be made for those who have any pretensions even to the rudiments of art or science? In our own time, when we daily observe natural causes, by skilful combination, producing effects more wonderful than any that past ages ever could have witnessed; when we see automatons, some like insects, moving from one place to another; some like birds, clapping their wings, whistling their notes, and turning their eyes, as it were, to the different objects around them; some in the form and attitudes of men, walking, dancing, or tumbling on ropes; some drawing, writing, and singing; some playing tunes on a harpsichord, and some conducting a game at chess; we feel, for the moment, a kind of astonishment. And seeing former expectations exceeded, and the arts and sciences still in a state of progressive improvement, we no longer dream of magic and witchcraft, and invisible beings, to account for the various phenomena of nature; we blush to think of our former ignorance, and, prudently cautious, resolve to prescribe no more limits to mechanical powers, or to chemical affinities; we say within ourselves, why might not a superior intelligence construct animal and vegetable systems on like principles, so as to exhibit all the various phenomena of life? Nay, on looking round, do we not observe that these phenomena are actually produced in this very way?

An egg, when recent, does not exhibit, and could never have exhibited, any thing analogous to these phenomena. The eye cannot trace in it any thing more than an organized structure; and yet, in that state, regulate the temperature so as to prevent the derangement of its parts, and it will continue not only for weeks, but for months and years, a collection of mere organized matter. Yet, after these years, apply the degree or quantity of heat that the parent communicates when she is hatching, imitate her instincts, turn it at times, and continue the heat with occasional interruptions, and the embryo within will begin to grow, to move, and to live, and, at last, will exhibit all the instincts, appetites, and passions belonging to the species that first gave it birth. Suppose that this is a species of swallow, or one of that kind that may be reduced to the torpid state; suppose again that, upon the approach of the cold season, the temperature of this bird, artificially hatched, becomes low, its digestion languid, and that all its functions shall in succession be gradually suspended; it must again, as it was in the egg, be reduced to a mere organized structure; and yet this structure, as well as the egg, will, upon the return of warmth and of plenty, begin not only to move and to live, but to seek for a mate, to propagate its kind, and display all the instincts, and passions, and the restless vivacity peculiar to its tribe.

In this case do not the several phenomena of life proceed entirely from organism and heat? If, besides these, there be any other cause, of which of the senses, it may fairly be asked, is it an object? Who is the man that has seen it, or heard it? Who has ever touched it, tasted it, or smelled it? We need only look around to be fully convinced that, besides these two, any other cause is merely imaginary. Do we not observe most of our insects and plants gradually sinking into motionless torpor as the sun is retiring in the season of autumn? And observe we not, again, these insects and plants in full animation as he returns with exhilarating rays in the season of spring? And, while we see this with our own eyes, do we not hear from voyagers and travellers that, between the tropics, where he constantly dispenses so liberal a portion of his animating influence, the insects live, and the plants are adorned with blossoms and fruits, and with verdant foliage all the year round? If this hypothesis can sufficiently account for the vital phenomena, what kind of unnatural perverseness can possibly induce us to grope in dark and hidden corners in search of invisible imaginary beings, to perform what is naturally, obviously, and demonstrably performed without them? Can the thirst be natural, or the judgment sound, that prompts a man to plunge to the bottom and suck up the mud, rejecting the pure and salubrious stream that flows on the surface? After seeing so clearly what we have seen, we remain content with the obvious causes, and shall leave enthusiasts to hunt after mysteries, or indulge in fanciful whims and hypotheses, as being perhaps more congenial to their taste than facts and observations.

Should it be asked what is the cause, or what are the causes of those processes of organization which produce the organism that produces life, the answer is natural, obvious, and easy: it is a number of the particles of matter of certain kinds, in certain proportions, and in certain temperatures, combining together by their chemical affinities. And though it must be owned that we have not yet been able to discover the kinds, the proportions, the temperatures, and affinities that may be requisite in this or that case to produce an organism either animal or vegetable, yet we must be persuaded that chemical affinities, with the necessary auxiliaries, are fully adequate to accomplish such an object.

Contemplate only the wonderful effects of chemical combinations. Many of these are so truly extraordinary, that no man of the most consummate ingenuity and foresight can, from any minute and previous knowledge of the ingredients, conceive, *a priori*, what is to be the effect of their compounds. In these compounds repeated analysis has indeed ascertained that the particles retain their original properties; but then these are, in many instances, so mixed and modified, that none of the senses, however acute, nor even the most delicate chemical tests, can possibly detect them while in composition. Who, for instance, from having experienced the suffocating fumes of the nitrous acid, could have believed that it was a compound of azote and oxygen, like atmospheric air? Who could have thought that sulphur, which is an inflammable substance, and oxygen, so necessary to the maintenance of flame, could have formed an acid that, on mixture, lowers the temperature of snow? Who could have thought that hydrogen, also an inflammable substance, would, along with the oxygen, constitute water, a fluid that is so peculiarly adapted for moderating heat, for quenching thirst, and for forming snow, hailstones, and ice? In short, who, *a priori*, could have imagined that such aerial and invisible bodies, could have assumed not only a liquid but a solid form, that the particles of heat, and in great quantity, could have been concealed in the coldest bodies, and that light itself, in a state of combination, should cease to be luminous?

Let us not then presume to insinuate that the passions, the instincts, and appetites of animals, are entirely different from the properties of matter; for matter is a term not expressive of any particular substance, but a class of substances, and a class, too, that contains under it many orders, genera, and species; nay, sometimes is even made to comprehend whatever has existence, either as an object in nature or in thought. But, taking it even in the more limited and restricted sense, besides oxygen, light, and caloric, the electric, galvanic, and magnetic fluids, with all the tribe of imponderable substances, many of them not only extremely active, but extensively diffused, we have, under this class, all the varieties of earths and metals, we mean those denominated simple, because chemistry has not yet decomposed them. As for their compounds, we may suppose them to be almost infinite; for if two of the gases, as oxygen and hydrogen, can form water, and that water be afterwards converted into vapour and cloud, into rain and dew, hoar-frost, snow, hailstones, and ice, what an incalculable number of forms, structures, and qualities, may not be produced from all the orders, genera, and species, belonging to the class, and combining not only as simple substances with simple substances, but as compounds with compounds, in infinite variety? In the mineral kingdom what numbers of crystals, accordingly, do we see, all of regular and determined figures, and with forms indicating the nature and proportions of the different substances of which they are composed? In the crystallizations of the nitrate of silver, how often may we see the arborescent appearances of plants? How often may we see the like appearances in the crystallizations of water upon glass? How often may we see them on those stones which are called moccos, and on others which exhibit variegated landscapes? Nay, how often may we see the electric fluid arranging the particles of vermilion or sulphur into like forms, or if the vermilion and sulphur be mixed, attracting the one and repelling the other at the same time? In some moccos, a lively fancy has even discovered at least the external likenesses of animals; but whether the likenesses of animals or plants, no person has ever conceived them to be any thing else than the effects of chemical affinities in crystallization. They do not, it is granted, present any thing like circulation, digestion, or nutrition; but, independently of these circumstances, there is certainly an analogy and an approach to something like the external forms which are sometimes to be seen in both the animal and vegetable kingdoms; an approach, too, where the chemical affinities are commonly the sole agents. But if much weight is not to be laid on this kind of analogy, advance a little higher in the scale: observe those tumours in plants and animals that are occasioned by the punctures of insects when depositing their eggs. These tumours have their periods of growth, of vigour, and decay; are no parts of the plants or animals; they exist and grow by a kind of energy peculiarly their own, always hostile, and sometimes fatal to that of the bodies upon which they grow. Observe the febrile and variolous matters; the last of which invests itself with a determinate and sensible form, or with what is called, in the language of pathology, a regular type. Like living bodies, both have their periods of increasing, stationary, and decreasing action; both have the power of assimilating matter; and both, as well as animals and plants, propagate their kind.

Ascend yet higher, and mark the *animalcula infusoria* that spring up in myriads in vegetable infusions, specifically different, if the infusions be specifically different. Mark the *fasciolæ hepaticæ* of sheep, growing in the liver; intestinal worms of different genera, species, and varieties: mark also the thousand species of *pediculi*, or lice, and each peculiar to its own species of animal or plant, and then recollect that these occur in numerous instances where their origin cannot possibly be traced to any thing like parents or a sexual intercourse; then take a cool retrospective view of the whole facts, weigh them separately, and weigh them together seriously and fairly in your own mind; and then say, explicitly and candidly, to what else we can ascribe living organized systems of matter but to chemical processes. In what other light can we possibly view the sexual intercourse than merely as a circumstance which is often necessary to favour these processes at their commencement? Nay, in what other light can we possibly see even man himself than as a species of chemical compound, whose particles at the last hour of dissolution must again return each to the element from which it came; while the fabric they composed, like the flower of a season, or the insect of a day, after leaving perhaps another in its stead, shall, with all its instincts, appetites, and passions, and with all its reasoning and boasted powers, that were the result of its temporary organism, perish for ever?

SECTION VIII.

REMARKS.

THAT such were the commencement and such the termination of human existence, many may wish, and a few may believe; but those accustomed to reason and reflect, will not be disposed to place their reliance on observations that are carelessly made, or on general assertions, however boldly and confidently uttered. Even granting there is nothing in the universe but matter, yet where are the kinds that organize animals and plants? If they be any or all of the kinds that constitute the articles of food and drink, where are the qualities by which they organize particular structures, and where the qualities by which they organize such varieties of structure in both the animal and vegetable kingdom?

In the works of art, we readily comprehend how the same materials, whether earth, wood, stone, or metal, may be made to assume each an infinite variety of forms, and to enter into infinite varieties of structures. In these cases, the mere materials have nothing to do with the organization.

In the general argument in support of organism as the cause of life, an important circumstance is always overlooked. It is at this day invariably supposed that every part of an animal or plant which is dug up from the bowels of the earth[t], must once have lived; and that some one or other of the vital phenomena must have preceded and even been necessary to its organization. The reason is, that no species of organism whatever to be found in the animal or vegetable kingdom, or even among any of the works of art, has ever been known actually to exist where vital phenomena had not preceded,

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[t] In the seventeenth century there were many who thought that fossil animals and plants were mineral productions; a circumstance which sufficiently explains the reason why John Baptista Scaramucci, an eminent physician, was induced, in 1697, to publish at Urbino an essay of much learning and research, to prove that an elephant dug up in Thuringia was not, properly speaking, a mineral, but had once belonged to the animal kingdom; and that some leaves and branches of plants, which were partly petrified, had once belonged to the

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vegetable kingdom. Even so late as the eighteenth century, George Christopher Petri, in his learned work entitled *Elephantographia Curiosa*, is decidedly of opinion, that all fossils, whether resembling animals or vegetables, are of mineral production; and, supporting his hypothesis by numerous authorities borrowed from the ancients, makes use of this language concerning fossil ivory: "Est itaque ebur fossile substantia mineralis, lapidea, porosa, astringens, mollior tamen et levior aliis saxis, præsertim in medulla, quoad crustam autem externam durior, a spiritu lapidifico in terræ visceribus in formas varias et usus producta." After alluding to the quantities of ivory dug up in Silesia, Moravia, Saxony, Franconia, Denmark, Switzerland, Suevia, and other countries, he speaks of the elephant dug up in Thuringia, of the violent discussions which it had occasioned between some of the learned men of the time; and concludes by observing that those who believed in its mineral production had demonstrated their hypothesis, and obtained the victory. "In Thuringia prope Tunnam paucis abhinc annis repertum est ebur fossile bonæ notæ, prægrandis elephantini sceleti formam aliquo modo exprimens, de quo magna lis inter nonnullos eruditos est exorta: erat enim [probably Scaramucci] qui non dubitabat asserere, fuisse ex veri elephanti in terra reperti sceleto: tandem autem vicerunt, qui illud aliorum mineralium modo productum esse, ad oculum demonstrabant."—*Elephantographia Curiosa*, p. 255. Erefordiæ, 1715, 4to.

exhibiting themselves either within the organism itself, or in some other organism endowed with life. It seems to be therefore not only the natural, but necessary conclusion, that so far is organism from being the cause, that it rather seems to be the effect of vital phenomena; and hence it follows that the materials of food and drink, like the kinds of materials composing an automaton, may enter into thousands and myriads of structures, having no more concern in regulating their size, proportions, or forms, than the timbers and metals have in devising the plan of a ship, a church, or a palace, into which they may enter, and may enter with all their chemical affinities, but must enter merely as the materials, and not as the architects or the contrivers.

As the seeds of plants, and the eggs of animals, are evidently as much organized structures, and as much the effects of vital phenomena, as the plants and animals from which they spring, they sport but a silly and puerile sophism who first represent them as extremely minute chemical particles, and then, by taking advantage of their organism, say that by means of their chemical affinities, they afterwards produce animals and plants: the fact is, they are the plants and animals themselves, in their early or incipient state of existence. And this sophism, instead of accounting for their structure and organism, does, when closely investigated, imply no more than that plants and animals, however young, and however diminutive, at their commencement, grow older by time, and larger by nutrition.

It seems to be even tacitly admitted that, of all the known varieties, species, and kinds of matter, there is none to which the materialist himself ever ventures to trace the phenomena of life, either by experiment or observation. While matter, he pretends, is the only thing visible, and therefore the only assignable cause for every phenomenon that strikes the senses, he, nevertheless, regularly traces organization to imaginary atoms, or to species of matter that were never seen, to combinations which he does not even presume to explain, or occult qualities which have never been noticed in any table of chemical affinities. In short, this matter, as he represents it, cannot be better or more aptly expressed than in the language of Bombastus Paracelsus, *mysterium magnum*, a great mystery.

SECTION IX.

ORIGIN OF THINGS.

Ουδεν εξ ουδενος, *nihil ex nihilo fit*[u], nothing proceeds from or is made out of nothing, was a favourite axiom with many of the ancients, though, when coolly considered, it appears little more than a logical quibble, concealed under vague and ambiguous language. The truth is, that, in this short axiom, the word *nothing* is taken in two very different senses. The first *nothing* refers to every particular thing that has an existence; the second, on the contrary, to absolute nullity: and the meaning of the axiom, when conveyed in plain language, is, that, of all the things which exist, there is not any which derives its origin from a nonentity.

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[u] Δοκει δε αυτῳ ταδε· αρχας ειναι των ὅλων ατομους, και κενον... μηδεν τε εκ του μη οντος γινεσθαι. (Diogenes Laertius, p. 573. edit. Meibomii.) The author is speaking of Democritus, who, notwithstanding his favourite axiom, did, besides his atoms, consider a κενον, that is a vacuum or a mere nothing, to be one of the first principles of things.

From the axiom, therefore, on every acknowledged principle of reasoning, one is necessarily bound to infer that the universe, which is not only an entity, but an immense congeries of entities, must, if it did not proceed from nullity, have proceeded from an entity. And yet this was not the inference intended; for how, it was said, could the first entity that ever existed have proceeded from an entity that existed before it? For, supposing it came from an entity that preceded, it could not be the first; and yet, if it came not from something, nor from nothing, from what did it come? The fact is, by this said axiom, conveyed in such formal and ambiguous language, and with such a parade of logic and acumen, they just meant to say that it did not come at all, but existed from eternity; and with equal propriety they might have said it existed from yesterday, as eternity had no more concern than yesterday in its production; for although we say, in ordinary language, that such and such things should be left to time, that times will change, times will produce, and times will bring about alterations, no one, on serious reflection, has ever understood that phraseology in a literal sense.

But if we reject the origin from something, from nothing, and from eternity, what conception are we then to form concerning the beginning of the first existence? The answer is easy, obvious, and short. No conception at all; and for the most forcible of all reasons, because it is utterly beyond our comprehension. For, putting the universe out of the question, an object of vast inconceivable immensity, it will not be easy, on any principles exclusive of the vital, to answer these questions; what was the origin of the first egg, or what was the origin of the first bird? For where is the egg that comes not from a bird, and where is the bird that comes not from an egg? To the mere materialists, who exclude every species of vitality but that from organism, this problem is nearly as embarrassing as the origin of the universe itself; and therefore, to solve it, they have had recourse, as usually happens in most of their difficulties, to fate, necessity, to the laws of nature, to nature herself, or to the revolutions of eternity and the circle; a kind of beings of which all of them talk, which none of them sees, which they all acknowledge not to be material, and yet which they say not only cause but regulate all the operations of matter.

SECTION X.

ORDER OF THINGS.

Dismissing that most unanswerable question, how came the first of beings to exist? let us mention another; how came the things that actually exist to assume their present order and form, and not only to exhibit such an astonishing splendour and magnificence, but to be distinguished by such an extraordinary variety and beauty[1]? All have bestowed the highest eulogiums on these appearances, and all have acknowledged that, in art and design, they infinitely surpass the utmost contrivances of human genius; the human genius and the human organs being themselves only a part, and by no means the most wonderful part of the exhibition.

In pursuing this inquiry, if we cannot arrive at any clear or precise ideas concerning the cause of these singular phenomena, we may at least acquire some information respecting the powers and the resources of the human intellect, by attending to the more prominent opinions which ingenious men, in different ages, in different countries, and in the different periods of society, have been able to form upon a subject so generally interesting.

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[1] According to Diogenes Laertius, Anaxagoras the Clazomenian was the first who considered mind, as well as matter, to be a primary independent principle; commencing his elegant and sublime work with the following observation:—All things at first existed together in a state of confusion; then MIND afterwards came and arranged them. *Πρωτος τῃ ὑλῃ νουν επεστησεν; αρξαμενος οὑτω του συγγραμματος, ὁ εστιν ἡδεως και μεγαλοφρονως ἡρμηνευμενον. Παντα χρηματα ην ὁμου, ειτα νους ελθων αυτα διεκοσμησε.* He believed also that mind was the cause of motion, *νουν μεν αρχην κινησεως.* Diogenes Laertius, p. 82-84.

These opinions, we have already seen, are naturally arranged under two heads; and proceeding now to shew the reasonings on which they are founded, we shall introduce some of their most conspicuous authors, and begin with those who ascribe organism and vital phenomena to the chemical and mechanical properties of matter, but deny the separate existence of any thing like vital principles. Of this number is Ocellus Lucanus, one of the earliest of the Greek philosophers whose works are extant. Like most of his countrymen, when writing on subjects of this nature, he mixes dialectics with physics; and is more apt to mention his conclusions than the observations and reasonings which led to them.

SECTION XI.

OPINIONS OF OCELLUS LUCANUS [y].

To account for the appearances of the universe, he has recourse to eternity and the circle. Having fully proved, to his own satisfaction, that what is eternal is without beginning and without end, he has found that eternity, in some respects, is the same as a circle, and a circle therefore the same as eternity; so that whatever is predicated of the one, may to a certain extent be predicated of the other. As form then, he says, and time, and motion, and substance, are without beginning and without end, the universe itself, of which these are but parts, cannot have been generated, nor can it be corrupted, and may therefore be pronounced without generation, and incapable of corruption[*], or, viewed as a circle, to be without beginning and without end[a].

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[y] Vide Ocellum Lucanum *De Universo*, inter Galei Opuscula Mythologica, Physica et Ethica, p 505.

It is however an opinion not altogether consistent with the ordinary properties of the circle, that the stupendous circle of the universe is divided into parts that are totally dissimilar; for beyond an isthmus, which he has placed in the neighbourhood of the moon, are regions allotted for the residence of the gods, where all is still and invariably the same, without motion, suffering, or change; while, on this side the isthmus, the common boundary between what is generated and what is immortal, all is in a state of constant change and endless revolution[b]; the fates having drawn this line of demarcation to separate the passive and corruptible part from that which is impassive and subject to neither motion nor change[c]. At the same time, the changes here are just as endless as the permanencies there; for as these changes revolve in a circle, and as a circle have neither beginning nor end, they must be eternal.

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[*] Ὁ κοσμος αγεννητος και αφθαρτος. P. 515.

[a] Διοπερ αναρχος και ατελευτητος. P. 514.

[b] Ισθμος γαρ εστιν αθανασιας και γενεσεως ὁ περι την σεληνην δρομος. P. 516.

[c] Αἱ δε μοιραι αυται διοριζουσι και τεμνουσι το τε απαθες μερος τȣ κοσμȣ και το ακινητον. P. 515.

The causes of these revolutionary changes in this world below, are the four elements, fire, air, water, and earth, which are constantly passing into one another, the fire into air, the air into water, and the water into earth, and the earth again, by a contrary process, passing into fire, which, in his mode of reasoning, is going round in the course of a circle; though others might imagine that the motion here would rather be retrograde; and that the elements, when converted into earth, had no alternative in their attempts at any future change, but to return in an opposite direction. Yet round they go, according to Ocellus; and so likewise it fares with the vegetable kingdom, where plants are constantly passing into fruits, and fruits into plants; there being no exception whatever in this world below to this perpetual round of revolutions, unless with respect to man and animals, which, after passing through the four grand divisions of the circle, or the four great stages of life, are utterly dissolved, and perish for ever[d]; a most singular exception, and for which no reason is assigned. For these revolutions, the elements, it would seem, are entirely indebted to their *δυναμεις*, or faculties, of which each has four; those of the fire being heat, dryness, rarity, and sharpness; those of the air, softness, levity, smoothness, and tenuity; those of the water, coldness, moisture, density, and obtuseness; and those of the earth, hardness, roughness, gravity, and grossness; which powers or faculties, qualities or properties, being incorporeal, cannot be either generated or corrupted[e]. Among these faculties, heat and cold are active and efficient, while dryness and moisture are like matter passive.

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[d] *Τετραμερη κυκλον ανυσαντα και τας μεταβολας των ἡλικιων, διαλυεσθαι και απογινεσθαι.* P. 514.

On these principles, and with the aid of eternity and the circle, Ocellus Lucanus seems to imagine that all the various phenomena of the universe may be explained. His whole treatise consists of four chapters; and the passages here quoted and referred to are chiefly contained in the first two. In the fourth, indeed, he speaks of the deity conferring instincts and appetites on man: and in a fragment preserved by Stobæus, he says that life is that which holds the body together, and that the cause of life is the soul; that the world is held together by harmony, and that the cause of harmony is the deity; that states are held together by agreement, and that the cause of this agreement is the law. If these sentiments were actually his, they but ill accord with those which precede; though, like Pythagoras, he perhaps had one philosophy for the initiated, and another for the vulgar, which here, from accident or inadvertency, have been confounded with each other. At any rate, it is by no means an uncommon circumstance to see those who trust at first to the chemical and mechanical properties of matter for an explanation of every phenomenon, compelled at last to have recourse to fate, necessity, or some other cause invested with irresistible power, and with all the various qualities of mind.

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[e] Αἱ δε δυναμεις ουτε φθειρονται ουτε γινονται, λογοι γαρ ασωματοι τυγχανουσι τελων. P. 519.

In 1762, this treatise of Ocellus Lucanus was published separately, with a French translation, and copious notes, by the Marquis d'Argens, who addressed it to Prince Henry of Prussia, brother to the king[f]. This translator admires Ocellus so much, that he often insinuates, were it not for the faith which he professed, and his high veneration for the creed of the church, he would have adopted many of the sentiments of the Greek philosopher. One of the impressions which is therefore made, or intended to be made, through the medium of his notes, is, that many of the doctrines of religion and philosophy are not only at variance, but, in some cases of the first importance, in direct opposition. Nor is this idea peculiar to him: several divines have encouraged the same opinion. But as there are false species of religion, as well as of philosophy, the person who, under the general mask of the one or the other, undertakes, without making the distinction between what is spurious and what is genuine, either to defend or abuse indiscriminately whatever vulgarly assumes their names, may be strongly suspected, be his pretences what they will, to be pleading some secret cause of his own, in which genuine philosophy and genuine religion have no concern any farther than this, that they both have a chance, from his ignorance or prejudice, to be shamefully and unwarrantably misrepresented. The pure and the genuine spirits of each readily combine: it is only their scum and dregs that effervesce when they come into contact, and only those who float in the scum, or wallow in the dregs, that are hostile to the genuine spirit of either.

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[f] Ocellus Lucanus en Grec et en François, avec des Dissertations par Mr. le Marquis d'Argens. Berlin, 1762, 12mo.

SECTION XII.

OPINIONS OF DEMOCRITUS.

DEMOCRITUS, another ancient philosopher, the pupil of Leucippus[g], being less partial to chemical than mechanical processes, rejected many of the dynameis of Ocellus, and in order to produce the phenomena of the universe, required only an infinite vacuum, and an infinite number of minute atoms; but those atoms of different magnitudes, and of all possible variety of shapes, all of them solid, invisible, indivisible, and indestructible, all of them in motion, and all of them moving in a direction which was constantly deviating from a straight line. From the casual concourse of such atoms, he deduced the origin of the four elements; the origin also of the sun and moon, of the planets and the stars in the regions above, and of man, animals, plants, and minerals in the regions below[h]. But he did not explain how, in all their ramblings, they had never, through a long series of ages, constructed a city, a temple, a palace, or even a cottage; nor, in short, any thing which in structure and form bore an accurate resemblance to any productions of art or manufacture[i], or to any combinations formed by the labours of the lower animals; nor did he explain how those atoms which formed plants and animals at first by fortuitous combinations, did not afterwards continue the like operations, and form more in the same way, but, on the contrary, ceasing to obey their eternal impulse, *æterno percita motu*[k], left them to be propagated by generation; a new kind of process, the cause and discovery of which is not mentioned, as not probably belonging to those atoms. His atoms, it would seem, were, like our modern cosmogonists, better at explaining the structure and the revolutions of the globe, than the formation of an insect or plant, the down of a feather, or the spawn of a fungus.

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[g] Diogenes Laertius, in his lives of these philosophers, relates their opinions in a few sentences; and on the authority of Phavorinus, he observes, that Democritus, who was forty years younger than Anaxagoras, was accustomed to sneer at his notions concerning mind, and concerning the arrangement of the universe; διασυρειν τε αυτου τα περι της διακοσμησεως και του νου. (Diogenes Laertius, p. 569.)

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[h] Diogenes Laertius, lib. ix.

[i] "Si mundum efficere potest concursus atomorum, cur porticum, cur templum, cur urbem non potest? quæ sunt minus operosa et multo quidem faciliora." (Cicero *De Natur. Deor.* lib. ii. 37.)

[k] Lucret. ii. 1054.

SECTION XIII.

OPINIONS OF EPICURUS AS EXPLAINED BY LUCRETIUS.

THE doctrine of atoms, as held by Epicurus, is perhaps more fully described by Lucretius than by any other writer of antiquity; for although Laertius, in his life of this philosopher, may have stated his opinions with clearness and accuracy, yet the poet enters with ardour and enthusiasm into all his views; opposes his enemies, as if they were his own; combats every objection and difficulty; and with all the acumen of the logician, and all the animated diction of the poet, pours forth his whole genius and talents to illustrate, to support, and to recommend the favourite atoms of his favourite philosopher. From his view then, as being the most friendly, and the least liable to any suspicion of unfairness or injustice, we shall take the history of these atoms, and examine how far they are fitted, by the properties which he has ascribed to them, to account either for organization, or any other phenomenon of life.

With all the confidence which he has in their powers, he never brings them to the test of experiment or observation; never pretends that he has seen them, or that they can possibly be seen by any. He bestows on them many and various shapes, but never can explain how their shapes co-operate to form either an animal or a plant; nor how, amidst all their various combinations, they never by chance light upon any which, in structure, materials, and external form, exactly resembles any work of art. The immediate business of constructing animals he devolves on the elements, though the manner in which they perform it is a secret. He merely asserts that they do perform it, and that, in his time, many animals were formed by showers and sunshine out of the mud[k]. In these productions, the showers and sunshine must have acted the part of the male parent, as the earth, he held, must always be the mother, whoever was the father[l]. But if a mother, how came not this mother, like every other, to propagate an offspring after her kind; but, in place of young earths, to bring forth animals of different species, and all of them so very unlike to herself? The poet, instead of answering these questions, is only concerned about giving the reasons why she was not so fruitful in his time as she had been formerly; and his reasons are, that the times of child-bearing are always limited; and that, being then old and exhausted, these periods in her were approaching to a close[m]. For age, says he, alters even the nature of the world, so that what she did once she could not do then, and what she did then she could not do formerly[n].

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[k] Multaque nunc etiam existunt animalia terris,
Imbribus et calido solis concreta vapore.
Lib. v. 796.

[l] Linquitur, ut merito maternum nomen adepta
Terra sit, e terra quoniam sunt cuncta creata.
Lib. v. 793.

[m] Sed, quia finem aliquam pariundi debet habere,
Destitit; ut mulier, spatio defessa vetusto.
Lib. v. 824.

To another question, how came the world, so advanced in age, to be such a novice in the arts and sciences[o]? he replies, forgetting his former answer, that, from the little progress which it had made in the way either of invention or improvement, it must certainly have been of recent origin, and, at the period when he wrote, only in the course of its education[p].

His comparison between the earth and a mother, though common enough, will by no means bear a close examination. From feeding such a variety of species, and none of them after her own kind, she in some respects seems to have a much stronger resemblance to a putrid carcase feeding an immense diversity of maggots, than to any living being that is known under the name of a mother. She had still less the character of a mother, though a good deal that of a conceited and a bungling artist, when she endeavoured to fashion her offspring, not according to her species, but according to her fancy. And this attempt, it would seem, she had made when she first commenced the trade of a mother, producing, says the poet, at that time monsters of very singular appearances, of incongruous forms, with unnatural adhesions, and with strange deficiencies in motion and in parts[q]; and would probably have persevered in the whim, had not a being of superior authority luckily interposed, who, shocked at her monsters, put a stop to their growth[r], caused many generations of them to perish[s], and took the management out of her hands.

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[n] Mutat enim mundi naturam totius ætas.
Lib. v. 826.

[o] Quod potuit, nequeat; possit, quod non tulit ante.
Lib. v. 834.

[p] Verum, ut opinor, habet novitatem summa recensque
Natura mundi est; neque pridem exordia cepit.
Qua re etiam quædam nunc artes expoliuntur;
Nunc etiam augescunt. Lib. v. 331.

This being, who belonged neither to atoms, nor to elements, nor to any of their properties, was called Nature; a singular being of the feminine gender, that is always generating, but, like mother earth, is never seen generating after her kind. Her existence, however, being found indispensable to all the hypotheses that exclude a deity, she is still preserved in her high office by many of the moderns, and in this office has always been invested with great power, extensive influence, incessant activity, and uncommon prudence, has obtained the direction of the atoms and elements in all their operations, is every where present, sees into futurity, and prevents every thing which she does not approve. She creates and brings whatever lives to a state of perfection[t]; and does it always, according to method[u], or agreeably to laws imposed upon her by a higher power, which some call fate, and others necessity? A being certainly, if we can call necessity a being, which, on this hypothesis, must be entitled to that character for wisdom which poetically and vulgarly is ascribed to nature. For allowing that nature may understand the object of the laws which she has to execute, yet being merely the tool and the slave of necessity, it does not appear, on this view of the matter, that she has been concerned in their enactment, or has any other interest in their execution, than simply to obey the orders imposed on her.

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[q] Multaque tum tellus etiam portenta creare
Conata est, mira facie membrisque coorta, &c.
Lib. v. 835.

[r] Nequidquam; quoniam natura absterruit auctum.
Lib. v. 844.
Heic, natura suis refrenat viribus auctum.
Lib. ii. 1120.

[s] Multaque tum interiisse animantum secla necesse est.
Lib. v. 853.

With regard to animals, her orders are, to admit into their bodies only those particles which can be conveniently associated with the rest, so as to co-operate with them in their functions; to reject and cast to the earth whatever is likely to be useless or hurtful[v]; and further, to prevent either the earth, the atoms, or elements, from forming chimeras, or any kind of incongruous monsters, as partly man and partly beast, partly vegetable and partly animal, or partly fish and partly quadruped; to take care that every thing shall spring from its own seed, and in its growth preserve the characters of its own species[w]. Had it been otherwise[x], observes the poet, and had plants and animals been left to the guidance of blind chance to spring indiscriminately from any thing or nothing, we might then have seen men rising from the sea, the scaly nations swarming upon land, wild beasts and cattle dropping from the clouds, and mingling together in the forests and the fields; we should have seen no species of tree confined to any species of fruit; every thing would have been alike, and equally fitted to produce every thing, so that no one, from examining the parent, could possibly have said what was to be the species of the offspring, or conjecture, from the offspring, what had been the species of the parent. But the truth is, every thing that grows, grows from a specific seed, and can grow from no other, while in every seed there is a secret or occult faculty, *secreta facultas*, that defines and regulates all its future processes.

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[t] ——Ad extremum crescundi perfica finem
Omnia perduxit rerum Natura creatrix. Lib. ii. 1115.

[u] Sed, ne forte putes animalia sola teneri
Legibus hiis, quædam ratio disterminat omneis. Lib. ii. 717.

[v] Scilicet id certa fieri ratione necesse est:
Nam, sua quoique, cibis ex omnibus intus in artus
Corpora discedunt; connexaque, convenienteis
Ecficiunt motus: at contra aliena videmus
Rejicere in terras naturam; multaque cæcis
Corporibus fugiunt e corpore, percita plagis;
Quæ neque connecti quoquam potuere, neque inter
Vitaleis motus consentire, atque initari.
Lib. ii. 709.

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[w] ———————————Omnia quando,
Seminibus certis certa genetrice creata,
Conservare genus crescentia posse videmus.
Lib. ii. 706.

[x] Nam, si de nihilo fierent, ex omnibus rebus
Omne genus nasci posset: nihil semine egeret.
E mare primum homines, e terra posset oriri
Squamigerum genus, et volucres: erumpere cœlo
Armenta; atque aliæ pecudes, genus omne, ferarum,
Incerto partu, culta ac deserta tenerent:
Nec fructus iidem arboribus constare solerent,
Sed mutarentur; ferre omnes omnia possent.
Quippe, ubi non essent genitalia corpora quoique,
Quî posset mater rebus consistere certa?
At nunc, seminibus quia certis quæque creantur,
Inde enascitur, atque oras in luminis exit,
Materies ubi inest quoiusque, et corpora prima:
Atque hac re nequeunt ex omnibus omnia gigni,
Quod certis in rebus inest *secreta facultas.*
Lib. i. 160.

In this new theory, Lucretius seems to have lost all confidence in the eternal rambling of his atoms, in the earth, the elements, and in nature herself; he thinks now that all must be regulated by diversities of seeds or organic particles, endowed each with a peculiar *secreta facultas*, that makes them both living and organic. On such a hypothesis, the business of nature in carrying them onward to a state of perfection, is little more than that of a farmer or shepherd, who superintends the growth of his crops, or the rearing of his flock.

While his thoughts are occupied with this fancy, he not only regulates the form and structure of the body itself by the *secreta facultas* of its seed, but, depriving it of much of its influence arising from structure, deduces the soul also from a seed, and makes it, like the body, from its seminal qualities, display in its progress of growth and evolution, the species of seed from which it had sprung; and therefore concludes, that it is from this radical difference in the faculties of the soul, and not from a difference of organism in the body, that the lion is fierce, the fox crafty, and the stag timid[y].

As for the opinion entertained by those who believed that souls or animating principles organized the bodies, the poet rejects it without assigning any other reason, than that he could not see how they did it: he therefore concludes that they did it not[z]. Aware, however, that he might fairly be challenged, in his turn, to give some explanation how his *semina* or seeds were originally organized, he is strangely at a loss; and, forgetting the mechanical powers of his atoms, merely informs us, that heat and air, and the invisible power of the wind, *venti cæca potestas*, being mixed with that mobile and active principle that distributes motion and sensation to them all, they together constitute but one nature[a]. But as to the origin of that principle or that power, which he here says is the cause of life, sensation, and motion, he cannot pretend to be very explicit; it being, he observes, utterly concealed in the very innermost parts of the body, and latently diffused through every member, is the soul of the soul, the strength of the mind, and the energy of life: all he can say, with any decision, is, that it is composed of few and small particles; it reigns as sovereign throughout the body, and *is without a name.* As without such a principle, the other three ingredients, heat, air, and the *tenuis aura*, or the *venti cæca potestas*, could not account for sensation and motion, it was, according to the poet, absolutely necessary that a fourth ingredient of the most mobile and attenuated kind, and formed of the minutest and smoothest elementary particles, should be added to the mixture. In such an ingredient, the phenomena of life first make their appearance; and from such an origin, heat, air, and every thing in nature derive their motions. To it we owe the pulsations of the heart, the sentient powers of the different

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[y] Denique, quur acris violentia triste leonum
Seminium sequitur, volpeis dolus; et fuga cervis
A patribus datur, et patrius pavor incitat artus?
Et jam cætera de genere hoc, quur omnia membris
Ex ineunte ævo generascunt, ingenioque;
Si non, certa suo quia semine, seminioque,
Vis animi pariter crescit cum corpore quoque?
Lib. iii. 741.

[z] ——At, qua possint, via nulla videtur:
Haud igitur faciunt animæ sibi corpora, et artus.
Lib. iii. 736.

[a] Sic calor atque aër et venti cæca potestas
Mixta creant unam naturam, et mobilis illa
Vis, initum motûs ab se quæ dividit ollis;

Sensifer unde oritur primum per viscera motus.
Nam penitus prorsum latet hæc natura, subestque;
Nec magis hac infra quidquam est in corpore nostro;
Atque anima est animæ proporro totius ipsa:
Quod genus, in nostris membris et corpore toto
Mixta latens animi vis est, animæque potestas;
Corporibus quia de parvis, paucisque, creata est.
Sic tibi nominis hæc expers vis, facta minutis
Corporibus, latet; atque animæ quasi totius ipsa
Proporro est anima, et dominatur corpore toto.
Lib. iii. 270.

organs, and what pleasure or pain is felt either in the marrow or the bones[b].

But admitting the assertion to be true, that all kinds of sensation and motion are to be traced to this *nameless something*, composed of a few of the minutest and the smoothest atoms, all the other atoms of the universe must ever have remained in a state of rest, until they received an impulse from the *something* that is without a name. Yet all other atoms, according to Lucretius, have eternally been in motion; so that the *something* without a name must have existed before their eternal motion began, which sounds somewhat like an absurdity. Nor will it answer the purpose of the poet to say, that the atoms composing the *something* were, either from their minuteness or smoothness, more mobile than the rest. Let them be ever so easily moveable, that could not make them the cause of motion. From his own account, they are therefore distinguished from all other atoms, by having within them the power or faculty of causing motion, while other atoms have merely the capacity of being moved. Yet besides the power of causing motion, the *nameless something* must also have had the power of varying its motions in an almost infinite number of ways; for how could it otherwise produce the varieties of motion, sensation, and organization which distinguish the species of plants and animals? For if these varieties spring not originally from a cause which diversifies its operations, the *nameless somethings* must be as numerous as the diversities or species of seeds.

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[b] Jam triplex animi est igitur natura reperta:
Nec tamen hæc sat sunt ad sensum cuncta creandum;
Nihil horum quoniam recipit mens posse creare
Sensiferos motus, quædam quei mente volutant.
Quarta qnoqne hiis igitur quædam natura necesse est
Adtribuatur: ea est omnino nominis expers:
Qna neque mobilius quidquam, neque tenuius, exstat,
Nec magis est parvis et lævibus ex elementis;
Sensiferos motus quæ didit prima per artus:
Prima cietur enim, parvis perfecta figuris;
Inde calor motus, et venti cæca potestas,
Accipit; inde aer: inde omnia mobilitantur:
Concutitur sanguis, tum viscera persentiscunt
Omnia; postremis datur ossibus, atque medullis,
Sive voluptas est, sive est contrarius ardor.
Lib. iii. 238.

The hypothesis of the poet, that the several *animæ*, or vital principles of plants and animals, must grow from seeds as well as their bodies, though it may account for the continuance, will not account for the origin of a species[c]. Something, the cause of motion and change, must have originally, by design or accident, arranged the particles of each seed, and afterwards continued to operate in some way or other in preserving its species. But a man much more ingenious than our poet, could never discover any such cause in the four elements, in the fire, the air, the water, the earth, or in all of them combined: and therefore, to account for the origin of motion, of thought, and of foresight, of the faculty of invention, of the power of giving and receiving instruction, and for a variety of other phenomena, as memory, love, hatred, desire, sorrow, and gladness, even Aristotle himself was forced to have recourse to a fifth element, to something, he says, which was without a name, of the nature of mind; and so called the soul an ενδελεχεια, by a term of his own, expressive of continued and incessant motion[d]. That this something, the cause of thought, sensation, and motion, should be without a name, is singular enough; but it is more singular still, that Lucretius should wish it to remain without a name; for he can hardly allude to it without remarking, that it is utterly without a name, *ea est omnino nominis expers.* His wish surely could not arise from that kind of feeling which some have experienced, who, under the influence of religious impressions, cannot mention the name of the first of beings without a profound veneration and awe. It is not likely that our elegant poet had any such scruples; and he may therefore be presumed to have acted from a very different motive, though it could not be, that the *nameless something* itself was invisible. All the atoms which he describes are invisible also; and a part of his first book is employed to show that nature conducts her operations by invisible bodies:

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[c] That souls are propagated from souls, as bodies from bodies, was also the opinion of Apollinarius. Απολλιναριῳ δε δοκει τας ψυχας απο των ψυχων τικτεσθαι, ὡσπερ απο των σωματων τα σωματα. (Nemesius, p. 77.)

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[d] "Aristoteles longe omnibus (Platonem semper excipio) præstans et ingenio et diligentia, cum quatuor nota illa genera principiorum esset complexus, e quibus omnia orirentur, quintam quandam naturam censet esse, *e qua sit mens.* Cogitare enim, et providere, et discere, et docere, et invenire aliquid, et tam multa alia meminisse, amare, odisse, cupere, timere, angi, lætari; hæc et similia eorum in horum quatuor generum nullo inesse putat. Quintum genus adhibet, *vacans nomine;* et sic ipsum animum εντελεχειαν appellat novo nomine, quasi quandam continuatam motionem et perennem." (Ciceronis *Tusc. Quæst.* lib. i. § 10.)

> Corporibus cæcis igitur natura gerit res[*].

Could it possibly then be from this circumstance, that he found it difficult to trace its operations, as for instance, motion, sensation, and thought, to any thing like what he had previously represented matter to be; and thence concluded that its very name might excite inquiries, give it a kind of personification, an embodied existence and local habitation, and so lead to discussions that might ultimately be ruinous to his hypothesis? To favour any suspicion of the kind, would be to adopt the sentiments of Cudworth; who remarks, that "as physicians speak of a certain disease or madness called *hydrophobia*, the symptoms of those that have been bitten by a mad dog, which makes them have a monstrous antipathy to water, all atheists are possessed with a certain kind of madness, that may be called *pneumatophobia*, that makes them have an irrational but desperate abhorrence from all spirits or incorporeal substances; they being acted also at the same time with an *hylomania*, whereby they madly dote upon matter, and devoutly worship it as the only numen[f]."

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[*] Lib. i. 329.

Perhaps our poet can hardly be acquitted of this charge. He observes, that the world has been long in a state of horror and despair from the dread of these incorporeal beings; and acknowledges that his principal object in writing is to rescue mankind from their vain apprehensions, by showing that all things are corporeal and composed of atoms; that those atoms will in time separate and be dispersed; and that even the soul, being nothing more than a temporary compound of such atoms, will at last be dissolved, and cease either to feel or be conscious in a world to come[g]. It being his great difficulty to explain how the rambling atoms should form a compound that indicates any thing like design or intelligence, he neither accounts for the origin of seeds, nor for their diversities, but assumes it as a fact that they have all existed from eternity, or been formed by that imaginary being which he calls nature, and which, as it happens to suit his predominant humour for the time, he sometimes represents as acting with consummate wisdom and foresight, and sometimes without either thought or intention. In the present case, he deprives her of all kind of intelligence, and seems very anxious to inculcate the notion, that the world has been arranged, and the organism of plants and animals constructed without any view to their functions or uses; and so men, says he, should seriously study to avoid the error of supposing that the eyes were made to see, the feet to walk, or the hands to administer to the comforts of life. They must not imagine that the tongue was formed with a view to become an organ of speech, nor the ears with a view to become organs of hearing: as organs must exist before they can be used, so it must have been the organs that suggested their uses, and not any uses previously conceived that suggested the organs[h].

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[f] Cudworth's Intellectual System, p. 135.

[g] See lib. i. 63. 174.

He distinctly saw that a contrary opinion would lead to an idea that the works of nature, like the works of art, must be the effects of design and intelligence; an idea totally incompatible with, and utterly subversive of the hypothesis which he is here maintaining; for he, as well as those who have since adopted his opinions, was fully aware of the difficulties which he had to encounter in answering the objections from final causes. If the organs, however, of the animal structure suggest their own uses, to what being, or to what class of beings do they communicate this information? If they act independently by an occult faculty of their own, what is the cause that makes them co-operate? The legs, we know, can easily move in any direction to the east, the west, the south, or the north. What then is it, that prevents one leg from having a tendency towards the north, while the other is equally bent on a journey towards the south? If they cannot be separated on account of their adhesions, how comes it that their contrary tendencies never oppose or neutralize one another's exertions?

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[h] Illud in hiis rebus vitium vehementer inesse
Ecfugere errorem, vitareque præmetuenter,
Lumina ne facias oculorum clara creata,
Prospicere ut possimus; et, ut proferre viaï
Proceros passus, ideo fastigia posse
Surarum ac feminum, pedibus fundata, plicari:
Brachia tum porro, validis ex apta lacertis,
Esse manusque datas, utraque a parte ministras,
Ut facere ad vitam possemus, quæ foret usus.
Cætera de genere hoc, inter quæquomque pretantur,
Omnia pervorsa præpostera sunt ratione:
Nihil ideo quoniam natum est in corpore, ut uti
Possemus; sed, quod natum est, id procreat usum.
Nec fuit ante *videre* oculorum lumina nata;
Nec dictis *orare* prius, quam lingua creata est:
Sed potius longe linguæ præcessit origo
Sermonem; multoque creatæ sunt prius aures,
Quam sonus est auditus; et omnia denique membra
Ante fuere, ut opinor, eorum quam foret usus:
Haud igitur potuere utendi crescere caussa.
Lib. iv. 821.

It is true, indeed, if the ways of God be not as our ways, nor his thoughts as our thoughts, philosophers certainly ought to be cautious how they assign motives to him, or venture to assert with what views or for what end he willed this or the other event. But such a caution by no means implies that we should never impute to him any thing like design or foresight; it merely implies that we should not be too hasty and rash in ascribing to him our own ways and our own thoughts in accounting for his plans, or in explaining his modes of operation. Many have erred, and may daily be erring, in such rash attempts; but though their errors should serve as a warning for us to be more circumspect, modest, and guarded, they should not deter us from a field of inquiry so delightful and useful, because others who have entered upon it without the necessary means of precaution, have so often wandered, and hastily marked out ways of their own, which they vainly supposed could be nothing else but the ways of the deity[1].

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[1] In treating of final causes, it is hoped that no apology will be necessary for here introducing the following observations of a learned and ingenious translator of Buffon.

"Notwithstanding," says Smellie, "the splendid talents of the Count de Buffon, the translator thinks it incumbent upon him to caution the reader against a favourite and dangerous doctrine which the author, in some passages of his work, seems too anxious to inculcate. Like many of our modern French writers, he endeavours to banish final causes from the universe. It is a subject of much regret, that philosophers, the persons who are best qualified to unfold the mysteries of nature, instead of comforting and informing mankind, by shewing that her most hostile forms are real expressions of benevolence, and that the great chain of causes and effects, whether in the natural or moral world, are all intended to promote general felicity, should so frequently stretch their fancy for the perverse purpose of throwing a gloom over all her productions, and of excluding design from the operations of her great author. Because they cannot comprehend the supreme being, because they are unable to perceive his mode of acting upon matter, they therefore seem willing to disbelieve his existence. They have a partial knowledge of some of the properties of matter. These properties they consider as the only springs which produce and regulate all the movements exhibited both in animate and inanimate beings; and hence they rashly conclude that superior powers are unnecessary. This is not the proper place for reasoning. It shall only be remarked, that a universe without design and intelligence is more incomprehensible than an active

SECTION XIV.

MENS, ANIMUS, AND ANIMA.

One of the reasons which induced Lucretius to suppose the world of recent orgin was, that the arts and sciences in his time were only in pro-

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machine without a moving principle." Note to Translator's Preface, p. 12.

"M. De Buffon....seems to be ignorant of, or rather intentionally neglects, the distinction between final and physical causes. Final causes regard the design or the utility of particular objects, whether that utility relates to man, to the objects themselves, or to the general structure of the universe. But physical causes are limited to the explanation of particular effects, or modes of existence. *Why* were mountains, seas, or insects, created? *What* useful purposes do they serve? For the solution of these and similar questions final causes can alone be employed. But if it be asked, *how* were mountains and seas formed? *how* were insects originally produced? and *how* are their different species propagated? these are questions purely physical, and so different in their nature from the former, that nothing but stupidity or worse motives could possibly confound them.

"It may farther be remarked that final causes are the greatest stumbling blocks which lie in the way of atheists and materialists. They accordingly strain every nerve to remove them. But their force is so irresistible; their numbers are so immense; their beauties are so striking, and correspond so intimately with the warm and benevolent feelings of the heart; the concatenation and mutual dependence of all created beings, recognisable by our senses, are so apparent and so illustrious, that no powers of sophistry, no artful misrepresentations, no strokes of ridicule, will ever be able to diminish their influence, or weaken the force of those sentiments which the supreme being ingress[k]; and that he himself was the first who announced to his countrymen the discoveries and doctrines of Epicurus, which had but a little prior to that period been known to the Greeks, and then for the first time explained to the Romans in their native language[l]. As this new philosophy was that which our poet seems principally to have studied, at least to have admired, it led him to be much engrossed about matter, and either to neglect or but carelessly examine the phenomena of mind. It can hardly, therefore, be considered as surprising that, in treating of this subject, his ideas should be both vague and confused.

It has already been seen that the Greeks who believed in a vital principle, had long been accustomed to arrange its energies under different heads, as the φρην and the θυμος, two words which have different meanings in different authors, though the former, in general, implied the intellectual and voluntary functions, and the latter the involuntary, which originate either in sensation or instinct. It has also been observed that the

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tended they should excite in the breasts of his intelligent creatures. Final causes not only demonstrate the existence of a supreme intelligent power, but the infinite beneficence and minute attention of that power to the happiness of those beings on whom he has thought proper to confer existence." See Note, vol. ii. p. 71, edit. Edinb. 1780.

[k] Lib. v. 334. already quoted, p. 47.

[l] Denique, natura hæc rerum, ratioque, reperta est
Nuper; et hanc, primus cum primis ipse repertus
Nunc ego suum in patrias qui possim vortere voces.
Lib. v. 337.

same faculties were by some others arranged under three heads, the νους, φρην, and θυμος; the first including the functions of the brain; the second limited to certain functions supposed to belong to the viscera of the thorax; and the third denoting those spontaneous functions which are termed the vegetative or automatic, supposed to belong to the organs of nutrition, which they placed in the abdomen. But these divisions, as has been remarked[1], being merely logical, and none of them very accurately defined, from the want of marked physical distinctions to regulate the judgment in the classification, many have annexed different meanings, or shades of meaning, to the same terms; while others have imagined that each division indicates a separate species of principle. From these circumstances, and from the small degree of attention which he had bestowed upon its phenomena, Lucretius seems as much staggered at the nature of mind as at final causes, and as little conversant in the study of the one as in that of the other. In his attempts therefore to describe the distinction between the *animus* and *anima*, he is strangely bewildered, betraying his ignorance at once of the functions of organized structures, and of all those branches of philosophy which treat of them; branches which, long before his time, had been familiar to the Greeks. After concluding that the *animus* and *anima* are but two parts of the same principle [n], and after asserting that the *animus* must be corporeal, as it is affected, through the medium of the body, by weapons and wounds [o], he supposes that they both grow from separate seeds [p], have different functions, and occupy different situations in the body; the *animus*, which he thinks synonymous with *mens*, always residing in the middle of the chest [q], while the *anima*, diffused through the whole body [r], is every where present to obey its injunctions. The *mens* or *animus*, as if it were the head, the counsel or judgment by which all operations in the body are conducted[s], from being extremely subtile in its nature, and composed of excessively minute corpuscles, is the only part that knows what is wisdom, or feels what is joy; and therefore has many peculiar pleasures, in which neither the body nor the *anima* participates, though they both readily sympathize with it when it is unusually affected by fear.

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[1] See the notes in p. 8, 9.

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[n] Nunc animum atque animam dico conjuncta teneri
Inter se, atque unam naturam confacere ex se.
Lib. iii. 137.

[o] Ergo corpoream naturam animi esse, necesse est;
Corporeis quoniam telis, ictuque, laborat. Lib. iii. 176.

Ὡσθ' οἱ λεγοντες ασωματον ειναι την ψυχην, ματαιαζȣσιν· ȣθεν γαρ αν εδυνατο ποιειν, ȣτε πασχειν, ει ην τοιαυτη· νυν δ' εναργως αμφοτερα ταυτα διαλαμϐανομεν περι την ψυχην τα συμπτωματα. (Diogenes Laertius, p. 630.)

[p] Qua re etiam atque etiam mentis naturam, animæque,
Scire licet perquam pauxillis esse creatam
Seminibus; quoniam fugiens nihil ponderis aufert.
Nec tamen hæc simplex nobis natura putanda est:
Tenuis enim quædam moribundos deserit aura,
Mixta vapore; vapor porro trahit aëra secum.
Lib. iii. 229.

[q] Consilium, quod nos animum, mentemque, vocamus:
Idque situm media regione in pectoris hæret.
Lib. iii. 140.

[r] Cætera pars animæ, per totum dissita corpus,
Paret; et ad numen mentis, momenque, movetur.
Lib. iii. 144.

From this statement, the *anima* seems to be quite dependent upon the *animus;* so very dependent, as our poet thinks, that, without the presence of the *mens* or *animus*, a particle of the *anima* cannot remain for a single moment in any part of the whole body, but will instantly fly off into air, accompanying its guide, and leaving the limbs which it had animated to cool and stiffen in the chilness of death[t]. The *mens*, however, does not appear to be equally dependent upon its humble companion: in whatever part it chooses to remain, that part continues to live, though completely detached from the parts around it[u]. Nay, the trunk in which the *mens* or *animus* resides, although separated from the parts with which it is encompassed, will continue to live, if it contain only a portion of the *anima* within it; just as the eye, when detached all round, will continue to retain its vital powers, if only the pupil remains entire[v].

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[s] Sed caput esse quasi, et dominari in corpore toto,
Consilium, quod nos animum, mentemque, vocamus.
Lib. iii. 139.
Is tibi nunc animus quali sit corpore, et unde
Constiterit, pergam rationem reddere dictis.
Principio, esse aio persubtilem, atque minutis
Perquam corporibus factum constare.--- Lib. iii. 178.
Idque sibi solum per se sapit, et sibi gaudet,
Quom neque res animam, neque corpus, conmovet una.
Lib. iii. 146.
Verum, ubi vehementi magis est conmota metu mens,
Consentire animam totam per membra videmus.
Lib. iii. 153.

[t] Nam sine mente, animoque, nequit residere per artus
Temporis exiguam partem pars ulla animaï;
Sed comes insequitur facul, et discedit in auras,
Et gelidos artus in leti frigore linquit. Lib. iii. 399.

From this singular account of the *animus* and *anima*, it is difficult to say whether the poet had any steady or consistent opinion of the one or the other. If he meant to express the sense of Epicurus, as it is explained by Diogenes Laertius, his *anima* should signify the irrational soul, and be confined to the vital phenomena of the lower animals; while his *animus* should signify the rational soul, and be restricted to the vital energies which are characteristic of the human species[w]. But

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[u] At manet in vita, quoi mens, animusque, remansit,
Quamvis est, curtum cæsis, lacer undique membris.
Lib. iii. 403.

[v] Truncus, adempta anima, circum, membrisque remotus,
Vivit, et ætherias vitaleis subscipit auras;
Si non omnimodis, ut magna parte, animaï
Privatus, tamen in vita contatur, et hæret.
Ut, lacerato oculo circum, si pupula mansit
Incolomis, stat cernundi vivata potestas.
Lib. iii. 405.

[w] According to Epicurus, the το αλογον of the soul, or the irrational part, was, like the *anima* of our poet, every where

Epicurus himself does not steadily adhere to this distinction; and whatever meaning Lucretius intended, his ideas are extremely vague and obscure. Nor is obscurity or inconsistency a matter of singular occurrence with our poet. He observes, in passages already quoted, that the *animus* and *anima*, whether they be parts of the same whole, or separately sprung from different seeds, are, along with the body, decomposed at death; and yet he firmly believes, that the *simulacra* thrown off from the surfaces of bodies may continue long after in a separate state, and constitute the ghosts and apparitions which annoy the vulgar. Now, can it be either consistent or rational to suppose, that mere pellicles or vapours escaping from the surface, and exposed to the changes of heat and cold, of wind and rain, should retain the forms of organized structures long after the structures themselves which originally furnished them have been dispersed in air, and mingled indiscriminately with their native elements?

A similar inconsistency may also be remarked, on comparing his first and his fifth book. In the former of these, he strenuously endeavours to

diffused through the body; while the το λογικον, or the rational part, the part that is sensible of joy and fear, was; like the *animus*, confined entirely to the thorax or chest. Και το μεντοι αυτης αλογον ειναι, ὁ τῳ λοιπῳ παρεσπαρη σωματι· το δε λογικον, ὁ εν τῳ θωρακι, ὡς δηλον εκ τε των φοβων και της χαρας. (Diogenes Laertius, lib. x. § 66.) See likewise § 64, 65, 67, 68.—In the sacred scriptures, and in the writings of many of the ancients, the functions which are now ascribed to the brain were ascribed to the heart.

prove, from their inconceivable minuteness, that the first principles of things are invisible, and yet he confidently ventures to determine their shapes, properties, and differences of magnitude; while, in the latter, he is such an advocate for the evidence of sense, that he can scarcely believe the existence of any thing which is not supported by such an authority; denying that the sun can be much larger than what it appears to be, or its heat less than our feelings inform us[x]. In this miserable shuffling, he is often followed by the modern materialists, who, without producing the evidence of sense for their own hypothesis, arrogantly demand such evidence for whatever hypothesis is opposed to theirs.

One cause of the inconsistencies observable in Lucretius, is, that all his arguments are regulated by the bias of a hypothesis. If he who reposes his hope on the promises of religion must naturally wish that religion to be true, he, on the contrary, who only dreads the punishments which it threatens, must as naturally wish that the whole were a fable. Our elegant poet, who had no such hope, could view it only through the medium of fear, and therefore his whole reasoning is employed to remove its impressions; and accordingly he is seldom consistent in any thing, except in asserting his total disregard for the anger of the gods, his abhorrence of religion, and his disbelief of a future state. Thus, viewing nature in a partial light, and weighing his arguments in a partial scale, he does not deign to consider the effects which rational ideas of either a deity or a future state might produce upon virtuous and enlightened minds: he is rather disposed to expatiate on the consequences which erroneous notions upon these subjects have had on the minds of the vicious and ignorant. Upon these principles, he asserts that religion has often been the cause of the most impious and enormous crimes[y]; and were mankind to labour for ever under the impression that death is not to terminate their existence, he asks what end could they see to their miseries; and what means could they possibly contrive to oppose the threatenings of her and her priests, which every where hold them in perpetual dread of eternal punishments[z]? As no person, the poet thinks, can be totally exempted from these alarms[a], it is highly expedient, in his opinion, that every faculty of the soul should be exerted to dispel such terrors and darkness from the mind by the power of reason and the light of nature[b]; for to such an extent is human nature every where oppressed by a secret power[c], that well may we ask, where is the man whose mind is not contracted, and whose genius is not fettered, by the dread of the gods[d]? What gratitude then, says he exultingly, what lasting gratitude do we not owe to that *Graius homo,* that man of Greece, who, caring neither for temples nor thunders, for the threatenings of the skies, nor for heaven itself[e], did, on looking around him, and seeing mankind every where groaning under the foul and despotic oppression of a gloomy religion[f], not only display the skill and courage sufficient to oppose her, but even to vanquish her; so that we may now see her, in her turn, trodden under foot, and ourselves, by the splendour of so glorious a victory, on a level with the peaceful inhabitants of heaven[g]?

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[x] Nec nimio solis major rota, nec minor ardor,
Esse potest, nostris quam sensibus esse videtur.
Lib. v. 565.

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[y] Sæpius illa
Religio peperit scelerosa atque inpia facta.
Lib. i. 83.

[z] Nam, si certam finem esse viderent
Ærumnarum homines, aliqua ratione valerent
Religionibus atque minis obsistere vatum:
Nunc ratio nulla est restandi, nulla facultas;
Æternas quoniam pœnas in morte timendum.
Lib. i. 108.

[a] Quippe ita formido mortaleis continet omneis.
Lib. i. 152.

It is evident, from these sentiments of Lucretius, that he considered those parts of religion as the most objectionable which inculcate the notions of a deity with moral attributes, a watchful providence, and a future state of rewards and punishments: and it cannot be denied that such notions may be perverted to the worst of purposes, by the designing, the superstitious, and the ignorant. Instead of producing peace upon earth, they have not unfrequently been made the pretence for drawing the sword, for setting the son at variance against his father, the daughter against her mother, and for making a man's own household his foes[h]. But surely the perversion or abuse of a principle can never, in the eye of genuine philosophy, be made an objection to the principle itself. The alternative, therefore, which is here recommended, of disregarding all notions of religion, was observed, by the greater part of the ancients, to be attended with still worse consequences than any of the systems of pagan theology. Besides, it is utterly impossible to disregard feelings and impressions which are interwoven with the very stamina of our constitution. Although Lucretius could not discover a reason for any such notions, he nevertheless admits that there was no nation or individual entirely without them; and this observation, at least with regard to a future state, has since been confirmed by persons of more extensive inquiry[i]. Nay Epicurus himself acknowledged, that some notion of divine beings was quite irresistible, and that it will spring up in the human mind as a thing indigenous, without the adventitious aid of education[k]. The attempt, therefore, to eradicate this notion is not only foolish, but must in the issue prove ineffectual; and yet such an attempt, accompanied with insinuations that priests and their doctrines are great obstacles to the progress of science and of free discussion, is the only claim which not a few, even of the moderns, are able to produce for assuming to themselves the title of philosophers. But such zeal, real or affected, for the interests of philosophy, is not less contemptible or less suspicious than the zeal of the Pharisee, for what he calls the interests of religion.

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[b] Hunc igitur terrorem animi tenebrasque necesse est
Non radiei solis neque lucida tela diei
Discutiant, sed Naturæ species, Ratioque. Lib. i. 147.

[c] Usque adeo res humanas vis abdita quædam
Obterit. Lib. v. 1232.

[d] Quoi non animus formidine divom
Contrahitur? Lib. v. 1217.

[e] Quem neque fana deum, nec fulmina, nec minitanti
Murmure conpressit cœlum. Lib. i. 69.

[f] Humana ante oculos fede quom vita jaceret
In terris, obpressa gravi sub Religione. Lib. i. 63

[g] Qua re Religio, pedibus subjecta, vicissim
Obteritur, nos exæquat victoria cœlo. Lib. i. 79

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[h] Matth. x. 34.

[i] See p. 15.

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[k] "Quæ est enim gens, aut quod genus hominum, quod non habeat sine doctrina anticipationem quandam deorum? quam appellat προληψιν Epicurus, id est, anteceptam animo rei quandam informationem, sine qua nec intelligi quidquam, nec quæri, nec disputari potest. Cujus rationis vim atque utilitatem ex illo cœlesti Epicuri *de regula et judicio* volumine accepimus. Cum enim non instituto aliquo, aut more, aut lege sit opinio constituta, maneatque ad unum omnium firma consensio; intelligi necesse est, esse deos, quoniam insitas eorum vel potius innatas cogitationes habemus." (Cicero *De Natura Deorum*, lib. i. § 16, 17.)

CHAP. II.

OF THE SIGNIFICATION OF TERMS EMPLOYED IN DISCUSSIONS CONCERNING LIFE AND ORGANIZATION.

THERE are few persons, however little they may be interested in physics or metaphysics, who are not familiarized to the terms, *nature*, *elements*, *matter*, *form*, *quality*, *chance*, *fate*, and *necessity*; few who do not annex to them some signification as soon as they are announced; and yet few who precisely annex the signification which the speaker or writer, if he had any, intended to convey. In short, these terms are used in such a variety of senses, and each sense has such a variety of different shades, that the whole occasionally become the source of much ambiguity, error, and sophistry, which have a tendency to mislead the reader, and which sometimes even escape the writer who has no intention to deceive. Before, therefore, proceeding further in our inquiries, it may not be improper to give some idea of the meanings of which these terms are susceptible, and of the abuses to which they are liable, that the unwary may be upon their guard against the deceptions to which they are exposed, while perusing the works of ingenious writers who may have a favourite theory to support, and who may sometimes inadvertently impose upon themselves, as well as upon others.

SECTION I.

NATURE [1].

This term is sometimes employed to signify merely the works of creation; sometimes to signify not merely the works, but, along with the works, that secret and invisible power or powers by which those works are performed; sometimes, again, to signify exclusively a sovereign power which created them all, and which still continues to superintend them. In this last sense, it is termed by Lucretius *rerum natura creatrix;* and is by him, and other materialists, frequently and surreptitiously introduced to assist them in explaining how their corpuscles, monads, or atoms, were able to construct organized bodies, and, in the general arrangements of the universe, to exhibit such proofs of design and intelligence. In the same character it is also said to impose laws, and, by being every where present and active, to cause those laws to be regularly observed by every atom of which the four elements are composed; a tacit, or rather indirect admission, that the atoms alone, with all their imaginary properties and powers, were not sufficient to produce the phenomena which had been ascribed to them. Apprehensive, however, that a *nature* of such extraordinary attributes might imply the existence of something resembling a divine intelligence, Lucretius and others have chosen to assert, that this active principle consists merely of a number of laws, inseparably connected with the works of creation; laws which had somehow enacted themselves, and which continue to put themselves in force in a way which none has hitherto explained, or been able to conceive. These laws, when taken as a whole, formed what was usually styled by the poets the *venus genetrix;* by a few of the Stoics a *natura genetrix*, a plastic nature, a spermatic principle, or vegetative life; which, being entirely composed of laws, was afterwards personified, and, by a directly contrary supposition, made to originate the very laws from which it had before, by the first supposition, derived its existence. A nature of this kind, being deprived of every claim to design and intelligence, was forced to conduct all its operations by what were denominated *spermatic rules* [m], or *spermatic powers* [n], and in this way constructed the bodies called *semina rerum;* so that nature or the universe, in this sense, was to be viewed as a large plant, or an immense congeries of plants, exhibiting regularly organized structures, without the aid of any intelligence, sense, or sensation.

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[1] "Sed quid sit ipsa natura, explicandum est ante breviter, quo facilius id quod docere volumus intelligi possit." (Cicero *De Natura Deorum,* lib. ii. § 32.)

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[m] Σπερματικοι λογοι.

[n] Σπερματικαι δυναμεις.

Others, imagining that these *laws*, or *powers*, if merely vegetative, would hardly account for the productions of the animal kingdom, and supposing such powers to be partly included in those which are animal, conceived that nature was rather an animal; and that, whatever indicated life, did so through the influence of the *anima mundi*, or through portions of that *anima* allotted separately to each individual: a supposition which, as well as the last, evidently implies, that those who entertained it, in accounting for life and organization, saw there must be something that was widely different from the materials of which organized structures are composed. In treating of this subject, the learned Cudworth supposes a species of plastic nature, or vegetative life, a real but incorporeal substance, through the medium of which the deity organizes animals and plants; and he thinks that this opinion is agreeable to the sense of the best philosophers [o].

On the other hand, the atomical theorists, when they either thought or reasoned consistently, could form no other idea of nature than that it consisted of an almost infinite number of atoms, which, either by chance or chemical attraction, were collected together in a variety of different assemblages;

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[o] See Cudworth's Intellectual System, p. 152, 162, 163.

that some of these, meeting accidentally in particular groups, did, without deliberation, without a plan, and without any previous consultation, somehow unite in arranging the structures of organized bodies; and that at last, in the course of time, and after ages of incredible adventures, the whole stumbling upon certain methods for regulating the affairs of the whole universe, their modes of operation came to be select, steady, and rational, and thence were denominated the laws of nature.

If, to these broad and generic distinctions between the different meanings of the word *nature*, we add the numerous modifications which they often undergo in the theories and hypotheses of individuals, this term, in the writings of the ancients, as well as of the moderns, will express as many different ideas as there have been different pens to write it, tongues to utter it, or minds to conceive it. All however seem to suppose that, whatever it may be, it operates by laws; and though few or none have yet ascertained what those laws are, it is generally admitted that they are just, suitable, and effective, whether they have ultimately proceeded from one, two, or more of the elements, and their several qualities; or from a vacuum and an infinite number of indivisible and invisible atoms of the same quality, but of different shapes, moving incessantly by external force; or from numbers of atoms of different qualities, as osseous, sanguineous, visceral, and the like, as, according to Lucretius, was the opinion of Anaxagoras;

or from numerous atoms with innate forces, as appears to have been the opinion of Strato; or from atoms having the nature of seeds, with a species of life and organization, and so termed by Lucretius *corpora genitalia*, or *semina rerum;* or from an animal and vegetative life acting from necessity, without either design or intelligence; or from an intelligence the effect of some organic arrangement; a *mens nullo corpore*[p], a mind without a body, according to some, being quite inconceivable; or, according to Zenocrates[q] and others, from some separate incorporeal intelligence distinct from the elements and the parts which compose them.

Without being able therefore to agree about the origin of these laws, or the modes of operation in the works of creation, philosophers have only coincided so far as mutually to adopt the term *nature;* a term, we have seen, of so vague and indefinite a meaning, that it can be accommodated to any hypothesis, and, by the help of personification, can be substituted for the name of that supreme and intelligent agent who directs the universe; or, by making it plural, for the names of those invisible agents that act under his power and authority. Thus says Hippocrates, the *natures* of things are the physicians of their diseases; *nature*, without any instruction, does what is proper; *nature* contrives expedients for herself without the processes of ratiocination; those acting under her direction do they know not what, and yet appear to know what they do; proceeding upon some general plan of which they are ignorant, never comprehending that which they will, or that which they will not, nor even so much as that which they see, but, insensibly impelled to fulfil the purposes for which they were destined, act from a kind of divine necessity [r].

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[p] Ciceronis Lucullus, § xxxix.

[q] Ibid.

SECTION II.

THE ELEMENTS.

EVERY thing viewed as a primary constituent of a physical body, of an art, or a science, has been called an element. But it is only the elements of our own invention that are yet known; the elements of physical bodies and the universe have not been ascertained. What were supposed to be elements once, are found not to be elements now; and if they be allowed to retain the name, it is only from courtesy. Fire, air, water, and earth, which, out of respect to ancient usages, are still denominated the four elements, were, as we have seen, suspected and known at an early period to be compound bodies, believed to pass into one another, and to be only modifications of one general and common principle; some imagining that to be earth, some water, some air, and some fire; to one or other, or to two or more of which, when combined, they traced the origin of every thing else[s]. A few, however, rather supposed that the common principle was prime matter, something invisible, and totally destitute of form and qualities; while others, we have seen, from not being able to conceive a principle of this kind, imagined that all things had their origin from atoms, which were necessarily invisible, indivisible, and indestructible, but endowed at the same time with forms and qualities. Experiments indeed have since shown, that the four elements consist of atoms, and that these atoms are so very minute as to be invisible; and yet chemical analysis has not hitherto reached any ultimate atom in a separate state, namely, an atom that is not combined with some other atom, as some atom of a gaseous body, some atom of caloric, some atom of light, or some atom of the magnetic, electric, or galvanic fluids; supposing that light, caloric, and those fluids, are actual substances, and not the mere qualities or effects of bodies.

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[r] Νουσων φυσιες ιητροι. ανευρισκει ἡ φυσις αυτη ἐωυτη τας εφοδȣς ȣκ εκ διανοιης.—Απαιδευτος ἡ φυσις εȣσα, και ȣ μαθȣσα, τα δεοντα ποιεει. (Hippocratis Epidem. lib. vi. § 5. vol. i. p. 809, edit. Vander Linden. Lugd. Bat. 1665, 2 vol. 8vo.) Και θ' ἁ μεν πρησσουσιν, ȣκ οιδασιν, ἁ δε πρησσȣσι, δοκεȣσιν ειδεναι. και θ' ἁ μεν ὁρωσιν, ȣ γινωσκȣσιν, αλλ' ὁμως αυτοισι παντα γινεται δι' αναγκην θειην, και ἁ βȣλονται και μη βȣλονται. (De Diæt. lib. i. cap. vi. vol. i. p. 184.)

Of those who did not choose to reduce the four elements into primary particles, a few, to account with the greater plausibility for the various phenomena of life, motion, and organization, were inclined to add a fifth; while others, unwilling to increase the number, bestowed intelligence, and the power of distributing life and motion, on the element of fire: and therefore Hippocrates, in expressing not only his own sentiments, but those of Heraclitus, and many of the Stoics, makes use of this language: "It appears to me, that what is called heat is immortal and omniscient; that it sees, and hears, and knows all things present and to come[t]:" a mode of expression which, if figuratively understood, and not confined in its meaning by the context, would convey an idea not very different from that of the scripture, where the deity is called a consuming fire; the element of fire being the only one of the four elements that ever was dignified with the epithet νοερον, or intelligent.

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[s] Lucretius, lib. v. 705.

SECTION III.

FORMS AND QUALITIES.

From individual and detached impressions conveyed through the senses, arising from consciousness, or transmitted by the nerves from the different organs, the mind, by its own peculiar operations of combining, selecting, arranging, and abstracting, forms those ideas which are the prototypes of the works of art, genius, and fancy, and to which those works, as to their genuine and only originals, must always be traced, having no exemplars in the works of nature[u]. Besides, as the mind not only combines its various impressions, but analyzes them with equal facility, it can readily detach and examine as separate and independent objects, all those impressions which are derived from forms, odours, and colour, from tastes, sounds, or any other origin, however closely associated and mutually dependent they may formerly have been.

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[t] Δοκεει δε μοι, ὁ καλεομεν θερμον, αθανατον ειναι, και νοεειν παντα, και ὁρῆν, και ακουειν, και ειδεναι παντα, και τα οντα, και τα εσομενα. (Hippocratis Opera, vol. i. p. 112.)

From these different powers of the mind, and from the habit of regularly tracing the works of art to abstract ideas as their genuine originals, Timæus, Plato, and other philosophers, being led by analogy to suppose that the universe, and all its phenomena, bore evident marks of design and intelligence, naturally traced them to what they conceived their most probable origin, to abstract ideas in the mind of the deity; and accordingly concluded, that these ideas were the παραδείγματα, exemplars, or patterns, in resemblance of which the deity formed, constructed, and arranged the material universe[x]. And here, if Lucretius had asked these philosophers, how it was possible that the gods could ever have formed such ideas, or how they could have known and foreseen in their minds what men were to will, or through what a variety of successive changes things were to pass, unless nature, by unveiling her secrets, had previously instructed them in her modes of operation, the philosophers with equal propriety might have asked the poet, how it was possible that nature could have known these operations, unless she had previously learned them from the gods.

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[u] Those who imagine that such ideas are copies or impressions of certain objects which actually exist, or have actually existed, are called *realists*; while those who conceive them to be purely original, the effects of certain mental operations, or literally inventions unknown to the world till he who conceived them published and named them, are denominated *nominalists*.

From that peculiar power of the mind, by which it can examine the qualities of bodies as distinct and abstracted from the bodies themselves, many of the ancients, but especially the logicians, from viewing them generally in that light, came at last to conclude that forms and qualities were one set of objects, and matter another; and that matter, endowed with the mere capacity of receiving forms, was originally incorporeal[y], but that afterwards, by the addition of forms, which they ascribed to the deity, it was rendered corporeal and an object of sense. They did not, however, suppose that every portion of matter invested with form became an object of sense, but that, after being invested with form, it belonged to that class of substances which become objects of sense in the aggregate; a class of substances which the Greeks were accustomed to term αισθητα, and which they distinguished from another class of substances, denominated νοητα, which could only be perceived by the understanding. Lucretius, apparently aware of this nice distinction, regularly maintains that all his primary particles are bodies, *corpora genitalia*, though, when taken separately, nothing could be less visible or tangible, or absolutely less an object of sense, than he represents them[z]. As bodies, however, they strictly belonged to the class of αισθητα, or the objects of sense; while all the αισθητα, according to Timæus, were the εκγονα, the productions, or the common offspring of ιδεαι and ὑλη, of forms and matter; not that these forms were mere qualities, but, on the contrary, were οντως οντα, real substances in the mind of the deity, ουσιαι νοηται, substances perceivable, not by the senses, but by the understanding; and which, when they issued from the mind of the deity, gave form to matter, and, according to Plato, became the objects of thought and of science to inferior orders of intelligent beings.

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[x] Exemplum porro gignundis rebus, et ipsa
Notities hominum diis unde est insita primum,
Quid vellent facere, ut scirent animoque viderent;
Quove modo est unquam vis cognita principiorum,
Quidque inter sese permutato ordine possent,
Si non ipsa dedit specimen Natura creandi?
LUCRETIUS, lib. v. 183.

[y] Ασωματος δε η ὑλη.

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[z] Primordia tantum
Sunt infra nostros sensus, tantoque minora,
Quam quæ primum oculei cœptant non posse tueri.
LUCRETIUS, lib. iv. 110.

[a] Timæus de Anima Mundi: Galei Opuscula Mythologica, p. 544.

In opposition to this doctrine, Lucretius maintains that there are no such substances as ουσιαι νοηται, nor any such thing as those qualities and powers[b], which Ocellus Lucanus, Timæus, and Plato, had pronounced ασωματα, or incorporeal; and he therefore asserts, that every thing which has an existence is necessarily corporeal; that even a very shadow is corporeal; and not only a shadow, but tastes, voices, echoes, and words, nay images reflected from the surface of a mirror, are all corporeal, *corporeis e principiis constare*; and for obvious reasons, *ut lædere possint*, that they may affect, or be able to act on corporeal substances[c].

SECTION IV.

CHANCE, FATE, NECESSITY

These terms are grossly perverted when employed to express either causes or effects, as no one has ever supposed them to denote either substances or qualities, or indeed any thing but abstract ideas originating in the mind. In saying that such or such an event was owing to chance, we can mean no more than that the cause or causes which produced it were unforeseen, unknown, and unexpected; and in saying that fate governs the universe, we can mean no more than that the affairs of the universe are regulated by some determinate force which cannot be resisted. But from whence proceeds this determinate force? Certainly not from fate, which is not a substance, nor the quality of a substance, nor even the necessary or constant effect of any substance, or of the quality of any substance, either simple or compound. When literally interpreted, the word fate signifies something that is spoken or decreed; and such a decree, when regularly enforced by a being omnipotent and omnipresent, can neither be evaded nor resisted. But as such a decree could have no effect unless it were enforced, it necessarily follows that it must be he who enforces the decree, and not the decree which regulates the universe.

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[b] Ποιοτητες και δυναμεις.

[c] Lucretius, lib. iv. 538, &c.

The word necessity is often vaguely employed for the word fate, and is employed in different senses by the metaphysician, by the mathematician, and by the natural and the moral philosopher.—By what is called *metaphysical necessity*, the whole of a thing must always be greater than any of its parts; and the same thing cannot occupy two separate spaces at the same time, if each of them be commensurate to the whole of its dimensions. Here any contrary supposition would be quite inconceivable. By what is called *mathematical necessity*, the three angles of any given triangle must always be equal to two right angles, and the square of the hypoteneuse in a right angled triangle equal to the squares of the other two sides. Any contrary supposition could be proved an absurdity. By what is termed *physical necessity*, a man must die if kept under water for a week or a day, and die from hunger if deprived of every external sustenance for the course of a month. But a contrary supposition is not here inconceivable, nor is it absurd: it can only be said, that it does not coincide with past experience and general observation. Yet past experience is not always accurate; and observations, although they be general, may not be universal: there may be exceptions therefore to both, and exceptions not a few. By what is termed *moral necessity*, a righteous man cannot be unjust, nor can a man of veracity be guilty of a falsehood: but a righteous man and a man of veracity are so denominated only by comparison; and therefore when the man esteemed righteous happens to do wrong, and the man of veracity happens to deceive, we are only disappointed in our expectations, and find that, in trusting to moral qualities, we are liable to the same kind of deception, as, when trusting to the physical properties of bodies, we trust to something which has not been fully and accurately examined, and therefore to something which we do not understand. The case is different in metaphysical and mathematical science. There our premises may indeed be false; but, in drawing our conclusions, we trust only to immutable relations subsisting between the ideas of our minds; and we can always pronounce decidedly upon the nature of such relations, as they are relations subsisting between objects of our own creation, and therefore between objects with which we must be intimately acquainted. How different are these from moral agents, from physical bodies, and from physical qualities! The latter objects are not creations of our intellect: our knowledge of them, and of the relations which subsist between them, is only imperfect; and that imperfect knowledge is acquired by long experience, patient observation, tedious reflection, and reports from others, all of which are apt to be deficient, from the weakness of our intellect, the influence of passion, the prejudices of habit, careless inquiries, false reasonings, hasty conclusions, and the effects of scepticism as well as of credulity.

SECTION V.

MATTER.

The Greek logicians, who reasoned themselves into an idea of a ὑλη πρωτη, or primary matter that was incorporeal, gave it the name of ὑλη προσεχης, or secondary matter, when it was invested with forms and qualities, when, in their sense, it became a body and was fitted, at least when taken in the aggregate, to be an immediate object of sense. In the last acceptation, the word matter is generally understood in modern times, and is accordingly employed by physical writers as a common term expressive of a class comprehending under it a variety of orders, genera, and species; as earths, woods, stones, metals, and all the materials of arts and manufactures. From such a vague and extensive meaning, and from the circumstance that the thoughts, affections, ingenuity, and exertions, of at least the greatest number of mankind are daily, if not almost hourly, directed to some material object or other, their minds have become so habitually absorbed in what is material, that they can hardly imagine any thing beyond it; and hence the word has come to signify, not merely an object which strikes the senses, but whatever engages the understanding. Thus we say, a matter of reflection, a matter of regret, a matter of rejoicing, as if the term actually implied every object of nature and of thought, dead or alive, visible or invisible, real or fanciful; and thus we are insensibly led to the inference, that what is *immaterial* is of no account, or has no existence.

As it seems, however, to be generally admitted that matter, taken in its largest sense as a physical term, comprehends an immense variety of substances, and that its division into four elements, fire, air, water, and earth, is by far too extensive, considering that the earth includes a number of solid substances which must be arranged under different genera; that there is a great diversity of liquids beside the waters of the sea and rivers, many kinds of invisible fluids beside common air, and many modifications at least, if not distinct species of fire; that there are bodies which are organized, and bodies which are not, many bodies organized and living, and many organized, yet without the life which they once possessed; it becomes a matter of no small difficulty to discover any character which is common to them all. To say that they all occupy space, is merely to say that they exist. To say that they occupy portions of space, to the exclusion of every other substance, is not true, for heat is known to penetrate them all. To say, again, that they are all solid, is to employ the words liquid and fluid without any meaning; or, if the assertion be meant only of the ultimate particles, it is to talk of things which are unknown. To say, lastly, that they must all be extended, leads to the question, what is extension? and then we are told, that there is no extension which may not be supposed to consist of parts; and that those parts being also extended, must be conceived as susceptible of still further division: and thus we may proceed dividing for ever, always approaching nearer and nearer, but never arriving at that point which is termed mathematical, which some conceive to be a magnitude without parts, and some a position without magnitude. By indulging in these abstract speculations, and imagining that things correspond to our ideas, we may in some measure perceive how the ancients were led to believe that matter in its primary state was not only incorporeal, but without quality, without quantity, and without every thing by which a substance can either be defined or named[d]. Even Boscovich thought that its first elements were nothing more than mere points of repulsion and attraction; while Berkeley has seriously laboured to prove, that we have no evidence of its existence.

SECTION VI.

THE EVIDENCE OF THE SENSES, AND THE INFORMATION DERIVED FROM EXPERIENCE, NOT THE PRIMARY FOUNDATIONS OF OUR KNOWLEDGE.

If the physical inquirer should be surprised at these singular conclusions of speculative men, he should also consider whether or not his own principles, if closely investigated, may not lead to conclusions equally extravagant. If he supposes that all knowledge is derived from the senses, and that matter is the only object of sense, it must be evident that, on this hypothesis, we cannot with propriety ascribe phenomena to any thing but matter. But on what data is matter, in general, pronounced to be an object of sense? Its ultimate particles certainly are not so; and its aggregates, though many of them certainly are, seem but little calculated to account for life or organization; and, at any rate, they by no means account for their own formation.' But whatever may be their formation or their consequences, they must ultimately flow from those primary particles which are utterly beyond the reach of the senses. Besides, if matter be supposed to include a variety of substances, or rather every thing that has an existence, it is no explanation of a phenomenon to say merely it proceeds from matter. He who hazards such an assertion should point out the particular species or particular arrangement from which it proceeds, otherwise he gives us no information but that it proceeds from something unknown, and which he would wish to be called matter.

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[d] "Neque quid, neque quale, neque quantum, neque quidquam eorum quibus ens denominatur."

We may therefore safely venture to question the accuracy of the opinion, that all our knowledge is derived from the senses. As well might we say, that arts and manufactures are derived from the doors or windows of the houses by which the raw materials enter, to be afterwards prepared by the industry, skill, and dexterity of the workmen. But as our senses are prior in existence to our experience, we have still more reason to question another opinion, that all our knowledge is founded on experience. In the first place, the experience of others is not ours, and the knowledge derived from our own experience must in general be extremely limited, compared with the knowledge which we either derive, or may derive, from the accumulated experience of others; and yet, with respect to us, that knowledge is not directly founded on experience, but rather upon the evidence of testimony.

Prior to experience, we besides possess a species of knowledge which, as to self-preservation, is much more essential than any that we afterwards acquire, which seems to proceed directly from the author of our being, and which, so far from being the result of our own experience and observation, is the very groundwork on which they are founded: I mean that knowledge immediately derived from those natural instincts and feelings which regulate the various functions of our system, which stimulate our intellectual powers, and which, according to their strength or weakness, their healthy or their diseased action, stamp a character upon our experience, our observations, our reasonings, our conclusions. To be convinced that not only we, but likewise the lower animals, possess such a knowledge, let us only attend to the following facts. When an animal wishes to move but a limb, by what experiment or process of reasoning does it come to know the necessary muscles, the particular nerves proper to excite them, or the quantity of energy to be given to each, so as neither to exceed nor to fall short of the object in view? By what experiment or process of reasoning does it come to select, amidst infinite varieties, the particular aliments which the stomach and its juices are fitted to digest? When inclined to feed upon other animals, by what experiment or process of reasoning does it come to know the most appropriate means to overtake, to subdue, or ensnare them? By what experiment or process of reasoning come the bee, the ant, and many other animals, to provide against the seasons of scarcity by laying up stores; or, when scarcity arrives, by what experiment or process of reasoning do others come to know the distant countries and the different climates where food is in plenty, and to which they can migrate? By what experiment or process of reasoning comes a third set to learn, that they can sleep during the winter without any food, and only need to select their retreats, which they generally do with so admirable art that but few are discovered? By what experiment or process of reasoning come species and genera, that have very different periods of gestation, to calculate the time of the sexual intercourse, that the birth of their offspring may coincide with the period of the year when the requisite food is prepared for their sustenance? By what experiment or process of reasoning do any come to know when to eat and to drink, and to fall asleep? Are not they and are not we in a manner impelled to attend to those important functions, by the powerful instincts of hunger and of thirst, and that drowsy torpor which, at stated periods, arrests our exertions, and closes our eyes on the world around us? The effects and intentions of these causes we see and understand; but in what particular manner they operate we cannot perceive. Let man then but think on these primary causes of action and feeling; and whatever his reasonings or opinions may be, he will find them linked with some one or other of these original springs or energies of his constitution, with some instinct, appetite, or passion, or with some function called a mental faculty; sources of action which not only are prior to all his experience, observations, and reasonings, but, what is more, are, during his life, not unfrequently regulated by circumstances, external and internal, over which he has little or no control.

But if such be the facts, what then, it will be said, is the use of experience, observation, and reasoning? Their use is still great. These and the instincts can to a certain extent mutually aid, oppose, and regulate one another, so as to preserve, or contribute to preserve, a juster balance in the moral system. The instincts, too, as well as the intellectual faculties, may be diseased, may be perverted, or may be deceived; and in all cases where they point only to immediate objects, or act according to immediate circumstances, they give no warning of the snares, the troubles, and the dangers which may follow as the consequences of indulgence. Hence we are able to ensnare, capture, and destroy the lower animals, by taking advantage of their unguarded, unsuspicious instincts; while we ourselves, by trusting implicitly to such guides, are also ensnared by our fancies, our hopes, our pleasures, and our fears, and perish, as they do, from want of experience, just reasoning, and rational observation; or, in other words, from a want of that discipline of which the instincts are partly susceptible, and which we have partly the means of administering, by possessing intellectual powers in a higher degree of perfection.

SECTION VII.

TO WHAT SPECIES OF MATERIAL SUBSTANCES CAN THE ORGANIZATION OF PLANTS AND ANIMALS BE RATIONALLY ASCRIBED?

IF by material substances we are to understand those which are mentioned in books of mineralogy, or enumerated in tables of chemical affinities, we shall not there meet with any species or number of species, that by any of their known properties seem in the least calculated to throw light upon organization or any single phenomenon of life. Wonderful, it is true, are the phenomena ascribed to light and caloric, to the electric, magnetic, and galvanic fluids; but as these can neither be measured nor weighed, nor confined in vessels, it is doubtful, at least many have doubted, whether they ought to be reckoned as substances of a peculiar order or class, or merely effects of certain operations resulting from unknown properties of matter. Yet, whatever they may be, if the forms either of plants or animals, like the forms of crystals in the mineral kindgom, were always to indicate certain definite species of matter, or definite combinations in definite circumstances, we might then have some reason to conclude that their forms and structures might in some way or other be intimately connected, if not associated, as cause and effect, with the materials of which they are composed, or with some of those contingent affinities arising from circumstances, and partly regulating the mode of combination. But while, in crystals, the specific form, colour, and hardness are the indications of specific materials, combinations, and proportions in specific circumstances, it is quite otherwise with animals and plants. The existence of these implies the previous existence of parents: all have specific periods of growth, vigour, and decay; all of them generate their own kinds; all of them are nourished through the medium of absorbents opening from without, or from an alimentary canal within; all of them grow by assimilating fluids which circulate through their system; all their modes of circulation are definite; nay, all their actions, all their forms, all their structures, and all the parts composing their structures, are definite as to figure, size, situation, connexion, and proportion; all of them likewise, and each according to its species or kind, form numerous varieties of compound substances, which are not to be found in the mineral kingdom, which no art has been able to imitate, and no chemical skill has been able to reduce to their ultimate particles.

Of the vegetable tribes, hundreds of species, and each retaining its specific characters, may be seen growing in the same soil, in the same degrees of temperature and moisture, feeding entirely on the same materials, and, when engrafted, numbers of them growing on the same stock, deriving their nourishment from the same vessels, and all of them converting the same kind of fluid, each according to its own species, into different forms, structures, and uses, and, at the same time, into various tastes, odours, and colours, so numerously diversified, and apparently so widely opposite in their nature, that all the senses cannot identify them with the originals from which they were derived. In the same way, thousands also of the animal creation may be observed deriving their nourishment from the same plant, and converting that nourishment into innumerable diversities of forms, structures, organs, and uses, such as have never been observed in any species or any individual of the vegetable kingdom. From these facts it is quite obvious, that the materials of food and drink have no influence in regulating either the forms or the structures of plants and animals. In these respects they seem entirely passive, and subjected to that agent which directs the process of organization. They take their station, and enter into compounds, like the materials in works of art and manufacture; that is, agreeably to a previous plan, in which their properties and inherent tendencies are no further regarded than so far as they can be forced to co-operate. In such artificial states, where their natural tendencies are under restriction, they continue no longer than while the compulsatory force is applied, and therefore, as soon as that which restrained them, and had produced the vital phenomena, ceases to act, they are again left to their natural tendencies, to those agents to which they were subjected in the mineral kingdom, under whose influence they sooner or later separate and disperse, to mingle again with their native elements. It is no wonder then that these materials have never, by their inherent properties, constructed any thing resembling the works of human design, or any thing resembling the fabrics which are formed by the lower animals. Hence we may perceive how the painter, the sculptor, and the mechanic, by combining their arts, and acting on a plan, can imitate the colour, the external form, and a few of the striking motions of animals; while the chemist, rejecting all ideas of design and intelligence, and trusting to the mere inherent properties of the inanimate particles of matter, has never yet, with all the powers of the mineral kingdom, or with all his knowledge of their affinities, been able to produce any thing that bears a tolerable resemblance, I will not say to a hair or a feather, but to any animal or vegetable excrement. Nay, even with the full complement of materials, and in just proportions, he cannot reproduce any animal or vegetable substance that is once decomposed; or cause a structure that has ceased to exhibit the phenomena of life to exhibit them again, or with all his art preserve that structure from exhibiting marks of decay and dissolution.

But indeed it is rather the pretenders to chemistry, than chemists of acknowledged eminence and science, that make such pretensions: Chaptal, Cuvier, and Dr. Thomson, who is second to no chemist in Europe, openly disavow them. It is not from them that we hear of these marvelous deeds of chemical affinities; it is generally from persons who have seen little, seen that little with astonishment, and have afterwards dreamed of more than they have seen. The credulous, ignorant, and idly curious, when they are actuated by a passion for the marvelous, will not rest satisfied with the evidence of the senses, or with the sober conclusions of reason; the cautious dictates of cool reflection and accurate observation are foreign to their nature. The facts recorded in philosophy and history have no charms for men of this description, unless they can employ them as the foundation of a romance, unless they can pervert them to give plausibility to stories of magicians, giants, and monsters, of untrodden regions, where plants and animals are totally different from those which are known, of seas where mermaids have often been observed, where whales are four hundred feet in length, and where huge krakens are seen extending for miles along the shores. If chemical affinities attract their attention, they must not be affinities of an ordinary kind; they must at least be equal, if not superior to the powers of magic; they must not only produce structures so as to move, but so as to live, to feel, to grow, and to propagate their species.

With the aid of such chemical affinities they seldom have occasion to allude to the deity; and as they adhere to the maxim of the poet [*], not to introduce him where it can be avoided, he rarely appears in their investigations as taking any interest even in the works of his own creation. As to plants and animals, he is only required to construct the first pair, or the first individual of each species, and then with a view to his ease and dignity they contrive for him a system of laws, to take the charge of his future operations; not laws indeed that are merely a dead letter like our human laws, but laws which are real and substantial agents, which understand his intentions and plans, which receive his orders, and see those orders regularly executed. By providing the deity with such active and intelligent laws, he is thus made to enjoy his ease as much as any of the gods of Epicurus: in the eye of these philosophers, he is nothing more than an idle spectator of the affairs of the universe; and by them he would be considered as acting improperly if he interfered to suspend or obstruct any of the plans which they have prescribed to him.

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[*] Nec deus intersit, nisi dignus vindice nodus.

CHAP. III.

OPINIONS OF THOSE WHO, SINCE THE REVIVAL OF LEARNING IN EUROPE, HAVE TREATED OF THE CAUSES OF ORGANIZATION, AND ASCRIBED THE PRINCIPAL PHENOMENA OF LIFE TO ORGANIC STRUCTURE.

SECTION I.

OPINIONS OF PARACELSUS.

ON surveying the map of the globe, as known to the ancients, and as known to the moderns, and reflecting at the same time on the numerous consequences which have resulted from the discovery of the mariner's compass, and the art of printing, we may at first be inclined to suppose that the knowledge of the ancients, with respect to a great diversity of subjects, must have been extremely partial and confined; and it certainly was so with respect to subjects on which they had no opportunity of exercising their genius and industry. But as to the subject of our present inquiry, they had nearly the same opportunities with ourselves; and as some of them applied to the investigation talents which we cannot hope to surpass, we can hardly expect, in proceeding to detail the opinions of the moderns concerning life and organization, to meet with much original or new, except in the mode of expression, and in a few additional illustrations derived from natural history, the study of anatomy, and improvements in chemistry. Elated however with these advantages, trifling when compared with those arising from superior judgment, energy, and acumen, many have treated the ancients with contempt or neglect; and have confidently ventured to explain, on principles which their ignorance has led them to consider as peculiar to themselves, various phenomena of organized bodies. Our improvements in chemistry, which, as applied to arts and manufactures, have certainly been carried to a great extent, began at a very early stage of their progress not only to attract general attention, but also to inspire many of those who assumed to themselves the titles of philosophers, with confident hopes that by these means they should soon be enabled to unfold all the secret causes of life, to prolong it to indefinite periods, and to convert all metals into gold.

Such were the expectations entertained by Paracelsus, the first and the most illustrious champion of chemical physiology; and though he did not properly form a sect in that branch of science, yet most of those who pretend to chemical acquirements, and apply them to illustrate the phenomena of life, frequently tread in his steps, and while talking of him as he talked of others, betray at the same time no small portion of his ignorance and presumption. According to Le Clerc[a], this singular person was born at Einfidlen, not many miles distant from Baden in Switzerland, in the year 1493. His name at full length, as appears from his works[b], was Aureolus Philippus Theophrastus Paracelsus Bombastus ab Hohenheim. He certainly was a person of no ordinary talents, energy, and address, but was destitute of judgment, candour, and delicacy; was often hurried by the ardour of his temper into such excesses of vanity and arrogance, as are scarcely to be equalled in the history of literature. As a physician he boasted of himself as infinitely superior to Hippocrates, Galen, and Avicenna; as a philosopher, he nicknamed Aristotle Caco-Aristoteles; and as a divine, it is reported by some of his contemporaries, that he spoke of Luther and Zuinglius as madmen, and threatened, if he once put his hand to the pen, he would send them, as well as the pope, directly back to school[c]. In his

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[a] Histoire de la Medicine, p. 792. edit. Haye, 1729, 4to.

[b] The edition of his works to which I refer was published at Geneva in 1658, in three volumes folio. It is said to be "editio novissima et emendatissima, ad Germanica et Latina exemplaria accuratissime collata; variis tractatibus et opusculis summa hinc inde diligentia conquisitis."

[c] "D'autres lui font dire, qu'il s'étonnoit que les ecrits de Luther et de Zwingle fussent reçus avec tant d'applaudissemens; que ces écrits-là etoient de vrais ouvrages de Bacchantes, et que

Paragranum, the running title *Theophrasti Magnanimitas* refers to a passage where his expressions bear a strong resemblance to the ravings of a madman[d]. The reader may form some idea of the man, of his high pretensions, and of his veracity, when he talks of the letters which were sent to him by Galen, bearing date from hell. Appearing at the time when Luther, Zuinglius, and others, were zealously exposing the errors of the church, he fondly imagined that he too might perform a work of no small credit to himself, by overturning the authority of Galen, which was

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si lui Paracelse daignoit mettre la main à la plume, il renversoit ces messieurs, aussi bien que le pape, tout droit à l'ecole." (Le Clerc, p. 796.)

[d] "Vos me sectabimini, non ego vos. Me, me, inquam sectabimini; tu Avicenna, tu Galene, tu Rhases, tu Montagnana, tu Mesue. Non ego vos, sed vos me sectabimini, vos dico Parisienses, vos Montepessulani; vos Suevi, vos Misnenses, vos Colonienses, vos Viennenses, vos quotquot Danubius et Rhenus alit, vos quos insulæ maritimæ claudunt, tu etiam Italia, tu Dalmatia, vos Athenæ, tu Græce, tu Arabs, tu Israelita. Non ego vos, sed me sectabimini, nec quisquam vel in extremo angulo latitabit, quem canes non permingent: ego monarcha ero, mea ipsa monarchia erit. Hanc administro, et vobis lumbos succingo. Is qui jam vobis placet Cacophrastus? Hæc merda vobis edenda est. Væ ergo miseræ Galeni animæ. Qui si in medicina immortalis fuisset, manes ejus in abysso inferni (unde ad me literas amandarunt, quarum datum erat, in inferno) non essent sepulti. Nunquam, nunquam, putassem equidem, tantum medicorum principem in podicem diaboli involare debuisse. Huc ipsum ejus quoque discipuli insequuntur. Hic vero medicinæ princeps ac monarcha sit! aut super hoc medicina exstructa stet!" (Paracelsi *Opera*, vol. iii. p. 183.)

then deemed to be as infallible in the schools of physic, as that of the pope in the cloisters of monks. But in this attempt he had to contend with various enemies at once, not only with the followers of Galen and Aristotle, but also with the priests, who, not contented with subjecting to their power kingdoms and states, had begun to extend their influence over the whole empire of science. In his time they had wonderfully succeeded in convincing the multitude that their most obvious and alarming diseases were not owing so much to natural causes, as to the displeasure or resentments of saints, as of St. Vitus, St. Quirinus, St. John, St. Anthony, St. Dionysius, St. Valentine*; and that cures or remedies were not to be sought for in drugs and prescriptions, but in prayers, penances, and expiatory offerings at the shrines of these saints. Being, however, rather disposed to envy than seriously to condemn these intriguers of the church, he was only anxious to subvert their authority, to acquire their influence, and by means as dishonourable as any which they had practised, to become the sole dictator himself. With such intentions of gaining popularity among those susceptible of religious impressions, he occasionally affected a superior regard for religion; and by his knowledge of chemistry, his arrogant pretences, and some remarkable cures which he had performed with mercury and opium, having obtained not only an unbounded confidence with the vulgar, but also with Erasmus and many of the learned, he at last laid claim to as lofty privileges as the pope himself, affected to be acquainted with the secrets of the deity, and pretended that God had revealed to him a chemical process by which he not only could cure men, and render them immortal [f], but could likewise create them. To procure some credit to this last assertion, he even ventures to communicate the general outline of the secret [g]. "Take the seminal fluid," says he, "of a man, shut it up in a sealed vessel, then put it into the belly of a horse, and let it remain for forty days, until it arrive at the highest possible state of putrefaction, or until it begin to live, and move, and appear to be agitated. At the expiration of this period it will have some resemblance to a man, yet will still be pellucid and without a body. If after this it be daily, cautiously, and prudently nourished and fed with the arcanum of human blood, and kept for forty weeks in the constant and equable heat of the horse's belly, it will then become a true and living infant, having all its members similar to those of an infant that is born of a woman, but much smaller. This production we term an homunculus; and it must afterwards be reared with the utmost care and attention, till it grow to full stature, and begin to have wisdom and understanding. This is one of the greatest secrets which the deity has revealed to a mortal and sinful man; for it is a miracle, one of the greatest of the works of God; it is a secret above all se-

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* Paracelsi Opera, vol. iii. p. 116.

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[f] In his eighth chapter upon long life, after mentioning the philosopher's tincture and stone, and the fifth essence, he adds, "Hæc atque alia complura Spagyricæ artis arcana reperiuntur, quæ corpus senectute confectum pristinæ juventuti quaqua versum restituunt, et ab omni ægritudine liberum reddunt." Vol. ii. p. 57.

[g] "Sperma viri per se in cucurbita sigillata putrefiat summa putrefactione ventris equini per quadraginta dies, aut tamdiu donec incipiat vivere, et moveri, ac agitari, quod facile videri potest. Post hoc tempus aliquo modo homini simile erit, at tamen pellucidum et sine corpore. Si jam posthac quotidie arcano sanguinis humani caute et prudenter nutriatur et pascatur, et per quadraginta septimanas in perpetuo et æquabili calore ventris equini conservetur, fit inde verus, et vivus infans, habens omnia membra infantis qui ex muliere natus est, sed longe minor. Hunc nos homunculum vocamus, et is postea eo modo summa diligentia et studio educandus est, donec adolescat, et sapere et intelligere incipiat. Hoc jam est unum ex maximis secretis, quæ Deus mortali et peccatis obnoxio homini patefecit. Est enim miraculum et magnale Dei, et arcanum super omnia arcana, et merito in secretis servari debet, usque ad extrema tempora quando nihil erit reconditi, sed omnia manifestabuntur, &c. Et quanquam hoc hactenus hominibus notum non fuerit, fuit

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tamen sylvestribus et nymphis et gigantibus arte multa tempora cognitum, quia inde etiam orti sunt. Quoniam ex talibus homunculis cum ad ætatem virilem perveniunt, fiunt gigantes, pygmæi, et alii homines magni miraculosi, qui instrumenta sunt magnarum rerum, qui magnas victorias contra suos hostes obtinent, et omnia secreta et abscondita noverunt; quoniam arte acquirunt suam vitam, arte acquirunt corpus, carnem, ossa et sanguinem, arte nascuntur; quare etiam ars ipsis incorporatur et connascitur, et a nullo opus est ipsis discere, sed alii coguntur ab ipsis discere." (Paracelsus *De Natura seu Generatione Rerum*, lib. i: Opera, vol. ii. p. 86.)

crets, and ought deservedly to be kept a secret till the last times, when nothing shall be hidden, but all things shall be made manifest. Although it is hitherto unknown to men, yet in remote ages it was known to the nymphs of the woods and to the giants, because from hence they also derived their origin. Since these homunculi, when they arrive at the age of maturity, become giants, pygmies, and other great and marvelous men, who are the instruments of great events, who obtain great victories over their enemies, and are acquainted with all secrets and mysteries; since by art they acquire their life, by art they acquire a body, flesh, bones, and blood, by art they are born; art is therefore incorporated and is connate with them, and they have no occasion to learn from others, but others are compelled to learn from them."

That filth, rottenness, putrefaction, and heat, will produce maggots, and other vermin, is a vulgar opinion of the present day; and that at an early period of the world they regularly operated on a larger scale, and produced animals of every description, was a general creed among the ancients. This story, therefore, of the origin and growth of an homunculus, was not unlikely to gain some credit at the time when it was published; and, where it was believed, was well calculated to inspire the ignorant, not only with an unbounded admiration of chemistry and alchymy, but also with a profound veneration for him who, by what he calls the Spagyric art, could accomplish such wonders.

With respect to that belly of the horse in which the first part of the process was to be conducted, it is hard to say whether he intended the belly of a dead or a living horse; and whether that high state of putrefaction, to which he alludes, was to be the effect of the vital processes upon the ingesta, or to arise from the corruption of the belly itself. If a dead horse, how was the belly to continue a belly for forty days and for forty weeks in a high temperature, hastening, not only daily, but hourly to a final dissolution, and yet not dissolved? If a living horse, how was the animal to continue alive with his belly repeatedly opened and shut in the course of the day, and that for a period of forty weeks, during the time when this homunculus required a supply of nourishment from without? or what must have been the state of his bowels for the forty days previous, while the contents of the sealed bottle in his belly were running to a high state of putrefaction?

This miserable fable I should not have deemed worthy of notice, but that many speculators are inclined to lend a favourable ear to similar reports of the wonders performed by chemical affinities. Amatus Lusitanus, as quoted by Blumenbach, mentions it as a generally established and well-known fact, that a human fœtus had been actually produced by the chemical art, *artificio chemico*, although it died as soon as taken out of the bottle[h]. Nay, a late periodical writer, in criticising Abernethy's *Lectures on the Theory of Life*, although he acknowledges that it is by the retorts, receivers, and alembics of the living laboratory alone that the union of its parts can be effected, yet cannot divest himself of the notion, that these retorts, receivers, and alembics, and the whole of the living laboratory itself, are the mere effects of the chemical affinities, belonging to the parts of which they are composed; not indeed of the ordinary chemical affinities, such as are known in dead laboratories, but of chemical affinities which are yet unknown, and which are the causes of all those inexplicable phenomena that occur so frequently and in such numbers in living bodies, or in what he rather chooses to denominate living laboratories. He even thinks that the ordinary affinities which are seen operating in the dead laboratories, are capable of more than they have yet performed, and that the reason why chemists have not yet made bones and muscles, is that no two of them are yet agreed about the proportions of their ingredients, and have not yet in their common workshops the necessary apparatus for combining such ingredients together[i]. With as much conceit of his own talents, and as much contempt for those who entertain different opinions, he is greatly inferior to Paracelsus in comprehension, fancy, and invention; otherwise it would have occurred to him at once, that the ingredients in their due proportions may be found in the bones and muscles of animals, and that by putting them in sealed vessels till fully decomposed, he might have tried with his chemical affinities to reproduce them[k]; and if he failed, might still have had recourse to the evasion, that he wanted the retorts, receivers, and alembics of a living laboratory; a laboratory which he knew could without his aid generate them easily, although in a way as mysterious to him as the way in which Newton made his discoveries would be to a fly, a worm, or a zoophyte. A French physiologist, of a much more enterprising genius, has

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[h] "Certo scimus chemico artificio puerum conflatum esse, et omnia sua membra perfecta contraxisse, ac motum habuisse; qui cum a vase ubi continebatur esset extractus, moveri desiit. Novit hæc accuratius Julius Camillus, vir singularis doctrinæ, et rerum occultarum et variarum hac nostra ætate magnus scrutator, et Hetrusca sua lingua scriptor diligentissimus et accuratissimus." (*Curationes Medicinales*, p. 612.) See Crichton's translation of Blumenbach on Generation, p. 11.

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[i] "Ordinary chemical affinity, it has sometimes been said, will not enable us to make a piece of bone or muscle, or to imitate any of the secreted fluids in our laboratories; why then should we suppose that this affinity is capable of forming them in the living body? But this argument we really think is somewhat unreasonable; for, in the first place, there are no two chemists who are yet agreed as to the precise nature and proportions of the ingredients of which either bone, or muscle, or any one secreted fluid is composed; and, secondly, were this preliminary point settled, we are far from possessing in our common workshops the apparatus necessary for combining these ingredients together. It is by the retorts, and receivers, and alembics of the living laboratory alone, that this union can be effected." (Edinburgh Review, vol. xxiii. p. 389.)

[k] Such an experiment appears to have occurred to Paracelsus; and if we can rely upon his veracity, we must believe that it was actually performed. The experiment seems to have been upon birds, which he says may be hatched by the heat of the armpit; a heat much inferior to the temperature of birds, but the proper heat, according to Reaumur, at least for the hatching of a chicken's egg, although that heat, as was found by experiment, required to be assisted by a certain dryness and pu-

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rity of the atmosphere, not often to be found in the region of the armpit, and never to be found accompanying the heat emitted from a dunghill. To preserve the materials and proportions required by the reviewer, he advises to shut up the animal alive in a sealed vessel, to reduce it to ashes in the third degree of heat, then to moisten the ashes, and leave them to putrify in the proper temperature, until they revive and exhibit again the phenomena of life and organization. In this way he says all kinds of animals may be reproduced.

"Nam in tali gradu ignis possunt ova in vitro et cineribus maturari, et viva avicula fieri: etiam quilibet homo sub sua axilla ovum maturare potest, et pullum procreare tam bene ac gallina. Et hic notandum est aliquid majus, nempe, si ista avis viva in sigillata cucurbita in pulverem vel cinerem comburatur tertio gradu ignis, postea ita clausa putrificetur putrefactione summa ventris equini in phlegma mucilaginosum, tunc iterum illud phlegma maturari potest, atque ita renovata et restaurata avis fieri: nempe si illud phlegma rursum in priorem suam testam vel receptaculum includatur. Hoc est mortuos revivificare per regenerationem et clarificationem, quod quidem magnum et profundum miraculum naturæ est. Hoc processu possunt omnes aves occidi et iterum vivificari, renovari et restaurari, et hoc est summum et maximum miraculum et mysterium Dei, quod Deus mortali homini patefecit. Sciendum etiam est, hoc modo posse generari homines sine naturali patre et matre, hoc est, non ex muliere naturali modo, sed per artem et industriam periti Spagyrici potest homo nasci et crescere, sicut postea dicetur." Vol. ii. p. 85.

lately attempted to produce living laboratories by the aid of the ordinary chemical affinities; and if we can believe his statements to be accurate, has completely succeeded. I shall advert to his experiments after mentioning some of the other opinions of the great spagyrist [l], who boasts of being the first who discovered, that the same cause which produces living bodies, is that which at a future period destroys them. By his present followers, this cause is generally supposed to be nothing else than the chemical affinities, from a singular fancy, that these affinities operate one way in a living body, and quite another way in a dead one[m]. The change, it is alleged, is owing merely to a change of circumstances, and the change of circumstances obviously occasioned by the great difference between life and death, and this difference between life and death occasioned by a change in the chemical affinities; so that the chemical affinities first change the circumstances, and then the circumstances change the chemical affinities. To the objection that this mode of reasoning in a circle is contrary to the principles of sound logic, the reviewer replies, that any other mode would be quite unphilosophical, and might ultimately lead to the hypothesis of a vital principle, and thus supersede the hypothesis of unknown and extraordinary chemical affinities which perform so many inexplicable wonders in the living laboratories. In short, he cannot admit an agent, about which, he says, nothing is known, to the exclusion of unknown circumstances, and to the operation of certain unknown chemical affinities.

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[l] "Spagyrica, vel spagiria, est ars quæ purum ab impuro separare docet." *Dictionariolum Paracelsicum.*

[m] "The living and the dead body, are obviously in very different chemical circumstances. In the latter, the functions of circulation and absorption have ceased, and there is no longer that constant supply of new matter to its different parts, nor that removal of the old particles, nor that universal diffusion of caloric which are so remarkable in the living machine. Until, therefore, this difference of chemical condition is shown to be insufficient to account for the difference of the compounds formed in the two cases, it is contrary to every rule of philosophising to have recourse to any other hypothesis for their explanation.

"But if there must be a theory of this sort, right or wrong, the advocates for a vital principle will supply us with one in a moment. It is this all-powerful agent, they assure us, that forms every texture and humour in the body; in whatever part it resides, there *the ordinary chemical* affinities are set at defiance, and when it departs, waste and corruption succeed." (Edinburgh Review, ibid. p. 390.)

But even the great spagyrist himself had at times his doubts about the efficacy of the chemical affinities of the seminal fluid in forming an homunculus. In that chapter where he treats of the generation of man, he considers this fluid as a mere secretion, rather intended for the purposes of health than of generation; compares it to mucus distilling from the nose; calls it an excrement; and in living bodies endowed with sensation, ascribes the structure and its formation, not to the influence of this fluid or its chemical affinities, but rather to the fancy, or to a spirit residing in the fluid; a spirit however derived from without, and not necessarily connected with either the proportions or the affinities of the seminal liquor. In bodies not sentient, the seed and that which grows are the same; but the case is widely different in men, and other sentient beings; that which is properly their seed, is derived from the will and imagination, and therefore they have seed or not as they please, according as the will and the fancy operate; and this is ordained that they may not be oppressed with it unseasonably, or want it when the occasion requires it. On such an occasion the fancy takes fire, the liquor of life, secreted from the male, kindles like wood, the uterus of the female in the mean time attracts it with powers similar to those of the magnet or amber, while the likeness and future character of the fœtus are stamped by the joint fancies of both[n].

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[n] "Sperma enim est purgamentum renum, sicut narium mucus excrementum est cerebri.

"Spiritus autem seminis, qui alterius hominis conditor esse debet, nec ipse inest aut crescit in ipso, sed creatus et ipsi datus est, ut arboribus et crescentibus reliquis.

"In rebus cæteris omnibus crescentibus semen cum sua materia unitum est.—In quibus semen et crescens res una sunt.

"Hoc ita intelligetis, quod nimirum Deus rei cuilibet sensu donatæ liberum arbitrium sui seminis implantarit, ita ut animal quodvis sentiens, si velit, semen aut habeat, aut non habeat. Semen ergo in voluntatem animalium positum est, ut eo nec graventur necessario instar aliorum crescentium, nec, si velint, priventur.

"Intelligendum est, quod liquor vitæ sit instar ligni, a phanta-

The reader may also readily perceive how much this second hypothesis is connected with, and how much it is founded upon another of our vulgar creeds, namely, that the fancy or imagination not only produces the nævi materni, but often regulates the form and the structure, and gives a direction to the future dispositions of the offspring which succeeds. In our popular creed, it is true, the credit is usually ascribed almost entirely to the fancy of the mother, whereas Paracelsus imputes one half of it to that of the father.

A third opinion which this author entertained respecting the formation of living bodies, is borrowed from some of the ancient metaphysicians. In this hypothesis he admits the existence of their ὑλη πϱωτη or primary matter to its full extent; but aiming constantly at something new in his mode of expression where he cannot arrive at a new idea, he chooses to call it *mysterium magnum*, or a great mystery, a thing uncreated, yet the common parent of all beings which have been created; created indeed, not in any order of succession, or continuation, but at once and together, at a single creation, and created as to sub-

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sia velut ab igne accensi.—Matrix a Deo condita est, ut magneticam et succinam naturam proprietatemque habeat attrahendi semen virile.—Ita et phantasia a Deo in homine condita est, ut hominem faciat talem qualis ipsa est.—In utrisque [viro scilicet et fœmina] phantasia suscitatur: uterque enim per se dimidiam saltem phantasiam habet.—Improbe ergo loquuntur cæcutientes isti medici qui vastos de spermate libros conscribunt, sperma scilicet id esse contendentes, quod ipsi sperma vocant." Vol. ii. p. 288–9.

stance, matter, and form, as to essence, nature, inclination, and tendency[o].

This kind of creation he thinks was effected by the goodness of God, who created or brought together into this great uncreated mystery every thing that is, not formally, not essentially, not distinctively as to qualities, but in such a way that each existed and lay concealed as a statue or image in a piece of wood[p]. From the simile with which this passage concludes, it evidently appears he had no steady or consistent idea of the ancient hypothesis of prime matter. For if, according to his own definition, and that of the ancients, it was something which had neither body nor form, neither quantity nor quality, nor indeed any character by which it could possibly be named or distinguished; and if, as he says, nothing could exist in it formally, essentially, or distinguished by qualities, nothing could exist in it as a statue or image in a piece of wood, where, if these do not exist formally, they certainly at least exist essentially, and not without qualities.

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[o] "Creatarum rerum universarum, quarum conditio caduca et fragilis est, principium tantum unicum extitit.—Hæc communis rerum omnium materia *mysterium magnum est,* cujus comprehensio nulla certa essentia ac idea præfigurata aut efformata sit, nec cum proprietate ulla inclinet, coloris simul et elementaris naturæ expers. Quousque sese æther diffundit, eousque *mysterii magni* orbis patuit.—Mysterium magnum unica mater est rerum caducarum omnium, ex quo illæ natæ ac exortæ sunt, non successionis aut continuationis ordine, sed simul ac una, in una creatione, substantia, materia, forma, essentia, natura ac inclinatione, prodierunt.—Mysterium enim magnum est increatum, et a summo illo artifice præparatum. Huic aliud consimile nullum producitur, nec idem ad seipsum redit aut reducitur." (Vol. ii. p. 239.)

[p] "Summum enim arcanum, hoc est, ipsius creatoris bonitas res universas in increatum creavit seu congessit, non formaliter, non essentialiter, non qualitative; sed unumquodvis in increato latuit, veluti imago seu statua in ligno inexistit." Ib.

In another passage, where he talks of certain secondary mysteries, general and special; the general proceeding from the great mystery, and the special from the general, in descending series, like the offspring of a family, he seems to forget his previous assertion, that all things were created at once in form, substance, nature, essence, inclination, and tendency, and not, as represented in this passage, through the medium of general and special mysteries in the order of succession and continuation. But this is not the only instance in which he has no sooner adopted an hypothesis, than he as suddenly rejects it for some other that accidentally falls in his way. If all things lay formed and concealed in the great mystery, he might, in the manner of Bonnet and Leibnitz, without any new or additional formation have afterwards gradually brought them into view by successive development. Yet this was not the mode suited to his train of ideas. On second thoughts, the first formations in the great mystery were somewhat imperfect, not sufficiently distinguished into genera and species, and therefore secondary mysteries were requisite, such as he calls the general and special, that plants, and animals, and whatever grows, might be regularly produced after their kind. On this third hypothesis one mystery springs from another in the order of succession, and every thing produced by a mystery is a mystery itself, and the cause of a mystery if any thing follow it. Dung, for instance, is the mystery of scarabæi, of flies, and of gnats; milk the mystery of cheese and of butter; cheese the mystery of the maggots that grow in it, and maggots the mystery of the fæces found in it; while all these mysteries are to be considered as nothing more than the offspring or descendants of the great mystery[q].

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[q] "Principium tantum unicum extitit. In hoc inclusa latuerunt creata omnia.—Porro, etsi *mysterium magnum* quidem sit rerum creatarum omnium, sensibilium simul et insensibilium; non tamen in ipsa formata fuerunt crescentia omnia, nec animalia, nec similia his alia: sed de illa ita statuendum est, quod omnibus *generalia mysteria* reliquerit et attribuerit, hominibus nempe et animalibus mysterium seipsa secundum formam suam propagandi, unipedibus suam essentiam. Et sic exemplo simili cæterorum cuilibet mysterium peculiare ad formam suam privatim producendam contulit. Ex eadem origine etiam surgunt mysteria, a quibus aliud produci potest, quam mysterium primarium ordinavit. Nam stella (al. stercus) est mysterium scarabæorum, muscarum et culicum, &c. Lac mysterium est casei, butyri, et quæ his alia conveniunt. Caseus mysterium est vermiculorum, in ipso nascentium. Sic vicissim vermiculi mysterium sunt ipsius fæcum. Hac ergo ratione mysteria duplicia existunt: *magnum unum* quod est *mysterium increatum*. Cætera, veluti nepotes, *mysteria specialia* vocantur." (Vol. ii. p. 239.)

Doubtful, however, on certain occasions, of the truth and accuracy of these hypotheses, he sometimes speaks as if the Deity were the primary matter, and sometimes thinks that every thing is formed, regulated, and destroyed by its own nature, or by something which acts in obedience to its nature, something which in his passion for novelty he terms an archeus, and boasts of being the first who invented the name and published it to the world[r]. This archeus, according to him, is the nature and disposer of all things[s], but more generally is a sort of agent subservient to nature. As nature, he says, requires an assistant to arrange and dispose of her different materials, that every thing may happen as it ought, the Deity, who alone is to be viewed as the *prime matter*, the first and the last of things and of beings, the all in all, and whatever is, willing that each genus and species should be formed and arranged according to nature[t], ordained an archeus for her assistant, and supplied it with three subordinate agents to officiate as labourers; namely, salt, sulphur, and mercury. Besides, as every thing has a nature of its own, so every thing also has an archeus, there being, exclusively of the general archeus, subordinate archei for each genus, for each species, for each sex, for each individual, and for each disease, in short for every thing, whether plant, animal, or mineral[u], as no separation, no combination, and no arrangement can ever be effected where an archeus does not preside[x]. In the vegetable kingdom it executes the offices which the ancients assigned to the vegetative soul[y], and according to Van Helmont, an admirer of our author, whatever offices belonged to the sensitive[z]. In the animal kingdom, with this author it

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[r] "Hunc nos destructorem *archeum vocamus, novo vocabulo et inaudito hactenus;* nam nunquam adhuc usque medicina per philosophiam adolevit, ut destructorem hunc, quisnam esset, intelligeret ac agnosceret. Notandum itaque hunc archeum intrinsecus in homine omnia Vulcania artificia disponere, facere, ac perficere, ac quamvis rem in ultimam suam materiam deducere." (Vol. i. p. 58.)

[s] "Archeus est natura et dispensatrix rerum." (Vol. iii. p. 528.)

[t] "Opus illa [natura scilicet] habet dispensatore qui ordinet et disponat conjungenda, ut fiat id, quod fieri debet. (Vol. ii. p. 346.) Sic Deus voluit ut quodvis fierit secundum

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suam naturam. (Ibid. p. 342.) Is solus est omnia in omnibus: is est rerum prima materia, is est rerum ultima materia, is est omnia. (Ibid. p. 342.) A Deo autem ordinatus est qui conjungat, archeus nempe naturæ. Is archeus postea requirit operarios suos qui conflent et fabricent rem illam, et in id perducant in quod ordinatum est.—Hæc sunt sulphur, sal et mercurius." (P. 346.)

[u] "Archeus fœminis cibos fœminaliter non viriliter digerit. Alius archeus alios morbos indicat. (Vol. iii. p. 173.) Archeus autem in ipsa [aqua] est is qui in natura disponit et ordinat, ut quodvis ad ultimam suæ naturæ materiam perducatur." (Vol. ii. p. 342.)

[x] "Archeus autem, qui elementorum separator est, et eorum omnium quæ in ipsis latent, rem quamlibet ab alia separat, et in suum locum collocat." (Vol. ii. p. 278.)

[y] Anima vegetativa, ψυχη θρεπτικη.

[z] Anima sensitiva, ψυχη αισθητικη.

is the impetum faciens of Hippocrates; there is no motion, no sensation, no alteration in animals without it[a]; it is the first thing which lives, the last which dies, and except when the rational soul interferes, the sole director of whatever is done in the animated structure[b]. It ought, therefore, in his opinion, to be an object of attention with every practitioner; as diseases exist only in the living, where their causes and cures must always in a great measure depend upon the archeus. Nay, such was the doctrine which in some measure was afterwards adopted by Stahl and his followers, which led to a practice that was often carried to extravagant excess by its admirers, and as often treated with contemptuous neglect by its opponents.

Should the reader be surprised that I have thus been induced to dwell so long on the reveries and dogmas of Paracelsus, I can only reply, that among the moderns he was certainly the first who brought chemical studies into general repute; that he greatly contributed to emancipate mankind from many superstitions, which were certainly as gross, if not grosser than his own; and that by breaking the shackles, or at least by assisting in breaking the shackles in which they were held by the dogmas of Aristotle, Galen, and the pope, he was eminently successful in restoring their minds to a freedom of thinking which they had not enjoyed for ages preceding. He was also the first and most zealous promoter of chemical physiology, which still retains much of his extravagance; and though his judgment was not sound, and though he even seems to have been at times affected with insanity, yet his talents were of a high order, so that few or none of his followers have equalled him in ardour, in energy, or in reputation. Incapable of reaching the nobler parts of his character, they have generally been content with adopting his follies, and carrying his conceits to a much higher degree of extravagance. Thus without the hypothesis of an archeus, and without a revelation which he thought necessary to form an homunculus, they fondly imagine that by their own genius and acquired knowledge of chemical affinities, they are perfectly prepared to accomplish such an object. I shall leave the candid reader to judge, if this imply not as high an opinion of their own talents, and as firm a confidence in the magical powers of chemical affinities, as that which Paracelsus entertained when he talked of his homunculi, or when he boasted that by his art he could restore youth to the aged, and protract life to an indefinite period.

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[a] " Adeoque archeum esse impetum facientem apud Hippocratem, extraque vel præter quem, nil moveri, sentiri, vel alterari in animantatis." (Van Helmont Opera Omnia, p. 520. Francofurti, 1682, 4to.)

[b] " Primum vivens, ultimum moriens, rerumque intus agendarum solus rector." (Van Helmont Opuscula, p. 245.)

SECTION II.

OPINIONS OF FRAY [c].

If many of the ancients were inclined to believe that heat, sunshine, moisture, and mud, when acting together, could produce animal and vegetable structures, they seldom ventured to describe the particulars of such a process. That task was reserved for Paracelsus, and those chemical physiologists who have happened to possess similar degrees of vanity and conceit. Upon the supposition that atoms, from exhibiting repulsions and attractions, might have an independent motion of their own, they perceive no reason why such atoms might not have been able to form small organized embryos, and why those embryos might not in time acquire life, sensation, and volition, and afterwards grow into animals or plants. These are the sentiments of a modern physiologist of the name of Fray, who from the number of his titles may be supposed a person of considerable literature, and of a respectable rank in society. His publication is entitled an essay on the origin of organized and inorganized bodies, and on some phenomena of animal and vegetable physiology[d]. His conjectures are, that this earth, and the several planets of the solar system, have originally derived the whole of their materials, whether they be gaseous, liquid, or solid, from the particles which issue from the body of the sun; that the four elements, fire, air, water, and earth, are but modifications of the solar rays; that consequently the sun is hourly decreasing, and his planets proportionably increasing in magnitude; that when the matter of the sun is exhausted, darkness will succeed, and that no power being left to retain the planets in their orbits, they must rush together, become again a general chaos, and this second chaos the source of a new order of things[e]. At present the substances proceeding from the sun in the form of light, united with those of a similar origin in the form of heat, gases, or air, electric, magnetic, or galvanic fluids, are constantly, he thinks, forming combinations, and producing not only mineral substances, but likewise certain organic globules, endowed with life and voluntary motion; and these globules combining also in various circumstances, are the causes of all the genera and species in the animal, mineral, and vegetable kingdoms. Those doctrines of organization, which the ancients adopted from loose observations, this author endeavours to demonstrate by experiments. He avers that, with the aid of a good microscope, he has seen these animated globules formed out of animal and vegetable substances that had previously been exposed to a very strong heat, and after this exposure immediately shut up in close

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[c] I introduce this writer and Darwin after Paracelsus, because their notions and their turn of mind have occasionally a striking analogy to his; I mean particularly those of Fray regarding the powers of chemical affinities, and those of Darwin when he is actuated by the ambition of starting new hypotheses and of coining new words.

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[d] Essai sur l'Origine des Corps Organisés et Inorganisés, et sur quelques Phenomènes de Physiologie Animale et Végétale. *Par J. B. Fray, Commissaire Ordonnateur des Guerres, Chevalier de l'ordre royal de la légion d'honneur, membre de plusieurs sociétés savantes.* Paris, 1817, 8vo.—Cabanis takes notice of this writer in a note to the preface which he has prefixed to his work entitled *Rapports du Physique et du Moral de l'Homme.* Paris, 1805, 2 tom. 8vo. His words are, " Depuis la première publication de cet ouvrage, M. Fray, commissaire des guerres, m'a fait connoître une suite de belles expériences qu'il a tentées sur le même sujet."

[e] " Il arrivera nécessairement une époque où la substance solaire ne suffisant plus à réparer les pertes de l'atmosphère, le calorique l'oxigène, l'hydrogène, etc. y seront en trop petite quantité pour renouveler l'eau en proportion des pertes qu'elle

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éprouvera sur la terre; la chaleur s'affaiblera et la sécheresse et le froid domineront à sa surface.

" Enfin quand, par une suite de siècles incalculable, toute la substance solaire aura été employée à la formation du globe de la terre et des autres planètes, la force qui retenait tous ces globes dans leur orbite respectif n'existant plus, ils seront nécessairement livrés à leur attraction mutuelle et réciproque; ils graviteront les uns sur les autres et se réuniront dans un point quelconque de l'espace. Ainsi, toute la matière de l'antique soleil, qui avait été divisée pour former la terre et les autres planètes, se trouvera réunie de nouveau après tant de millions de siècles de séparation; une nuit profonde enveloppera cette masse de planètes, et tout y sera soumis à l'empire des ténèbres; mais aucun principe n'y sera anéanti." P. 313.

vessels, with distilled water[f], and with either one or more of the gases, as oxygen and azot, in nearly the proportions in which they are found to exist in the atmosphere. In other experiments, which he has detailed at considerable length, he has seen such globules arise from burnt earthy substances and distilled water, and from distilled water itself when accompanied with the gases. As time, however, was required to form them, they did not make their appearance immediately, nor until the vessels in which their several materials were contained, had been exposed, sometimes for days, for weeks, or for months, to the light of the sun, and kept in a regular and genial temperature. In certain cases he had observed them to crowd together, and to form species of animalcula infusoria, in some cases species of byssus, in others confervæ, and in others animals with distinct organs of sense and motion, as poduræ, monoculi, flies, and worms. In other experiments he thinks he has proved that the light of the sun, distilled water, and gaseous fluids, naturally pass into earthy substances; and thus he accounts for all the productions of the mineral kingdom, and for the formation of the globe itself.

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[f] The like experiments, as we shall afterwards see, had been previously performed by Spallanzani to support his hypothesis respecting the pre-existence of germs. And long before Fray, Needham had observed that vegetable infusions, upon being regularly inspissated, assumed the appearance of a jelly, and that this jelly, when examined through a microscope, seemed to be composed of filaments or threads; that these filaments afterwards swelled, in consequence of some internal force, and divided themselves into a number of moving globules, which were perfect zoophytes, full of life, exhibiting the phenomena of spontaneous motion.—"Il paroissoit évidemment qu'après avoir laissé quelque tems l'eau attirer les sels et les parties volatiles, qui s'évaporoient en quantité, la substance dévenoit plus molle, plus divisée, et plus atténuée. A l'oeil nud, ou au toucher, elle sembloit être une matiere gélatineuse, mais avec le microscope on voyoit qu'elle étoit composée d'un nombre infini de filamens; et c'est alors que la substance étoit à son plus haut point d'exaltation, et qu'elle étoit prête à s'animer, pour ainsi dire. Ces filamens se gonfloient par une force intérieure si active et si productive, que même avant que de se diviser en globules mouvans, ils étoient de parfaits zoophites pleins de vie, et se mouvans d'eux-mêmes." *Nouvelles Observations Microscopiques, avec des Découvertes Intéressantes sur la Composition et la Décomposition des Corps Organisés*, p. 217. Paris, 1750, 12mo.

From the closeness of his vessels, he does not imagine that any but the particles of heat and light could possibly have entered; nor does he, at any time, seem to suspect the existence of other particles infinitely more subtile, as those for instance which Lucretius supposed to be the cause of motion and life, and which formed his animus and his anima animai. Before he presumed to ascribe such phenomena to the particles of heat, light, and the gases, he certainly ought to have shown that the existence of such vital particles was highly improbable; or if they existed, that they could not, like the particles of heat and light, have penetrated through the substance of his vessels. Yet to these last particles, and to these alone, without ever thinking of any other species, or the presence of a deity, he gratuitously ascribes the formation of his globules, and to the globules the formation at least of the lower orders of plants and animals; although he imagines that in favourable circumstances they might even construct the body of an elephant, and organize all other species of animated bodies which inhabit the earth[g].

To enable his globules to perform such wonders, he has hypothetically endowed the atoms of which they are composed with a great variety of inherent properties unknown and unnamed; and has also supposed his globules to possess sensation, instinct, intelligence, foresight, and the genius of an artist, besides varieties of volitions, actions, and powers of motion, to direct and control the laws of dynamics, the effects of chance, and other blind forces, which he says, can have no share in constructing living organized bodies [h].

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[g] "La nature, en mettant en œuvre les agens que Dieu lui a soumis, peut donc, comme nous venons de le voir, organiser la vie et procréer spontanément de petits animaux et de petits végétaux. Pourquoi donc, quand elle est secondée par le temps, dont elle dispose exclusivement, et qu'elle agit sur une matière organique accumulée pendant des siècles dans des lieux qui réunissent toutes les conditions nécessaires, que rien ne la trouble et ne s'oppose à ses combinaisons de choix et de préférence, ne donnerait-elle pas l'être à des animaux, ou à des végétaux ou plus perfectionnés ou d'une plus grande dimension? En effet, qu'elle différence essentielle y a-t-il donc, aux yeux du naturaliste philosophe, entre un *byssus*, une conferve et un cèdre; entre un ver, un podure, un monocle et un éléphant? Les conferves et les plus frêles moisissures vivent, croissent, se reproduisent et meurent: le cèdre vit, croît, se reproduit et meurt; le monocle ou le podure parcourt les mêmes périodes de l'existence que l'éléphant: comme lui, il a des organes, et qui sont peut-être plus compliqués et plus admirables par leur extrême ténuité; ainsi que lui, il a des sens, de la sensibilité, la faculté de se reproduire à un bien plus haut degré sans doute, et toute la dose d'intelligence nécessaire à la satisfaction de tous ses besoins; que pourrait-il envier à l'éléphant?" P. 96.

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[h] "*Chaque globule* et chaque organe existe à sa maniere, sent, juge et se comporte d'après ses attributs." P. 181.

"Si cette matière organique est assez délayée, assez pure pour que ses globules puissent obéir sans obstacles à l'instinct qui les anime et qui dirige leur rapprochement, ils viendront se réunir à ces divers foyers d'attraction organique et instinctive," &c. P. 147.

"Nous avons vu que les animaux étaient des corps infiniment composés, et que la vie générale dont ils jouissent *résultait d'une foule de vies particulières qui animent les molécules organiques.*" P. 201.

"Il nous parait également certain que l'instinct ou l'intelligence organique propre et inhérente a chaque globule," &c. P. 202.

"L'exposé qui précède a dû nous convaincre que les phénomènes si admirables qui s'opèrent dans les corps organisés *sont le produit d'une intelligence très active, dont le principe réside dans chaque molécule organique.*" P. 206.

"C'est sur-tout dans les diverses maladies qui attaquent les animaux, qu'il est resérvé au médecin éclairé et philosophe de s'assurer *qu'il existe dans les atomes de la matière organique une faculté judicieuse et prévoyante qui les oblige," &c.* P. 213.

"Dans les corps organisés, le génie de l'artiste réside dans chaque globule," &c. P. 213.

"La quantité de sang et des substances vitales et instinctives que le cerveau filtre," &c. P. 241.

"*Nous avons dû, en conséquence, rejeter loin de nous ceux idées de méccanique, de hasard et de forces aveugles avec lesquelles,*" &c. P. 206.

"La vie - - - ne se perfectionne que successivement et par la nutrition." P. 246.

The reader may possibly wonder that these globules, in constructing a varied and complicated system, should so seldom have occasion to alter the plan on which they commence, although their instincts, volitions, and genius, are only acquired successively, gradually, and by nutrition; the globules proceeding from animals and plants having always the highest degrees of vitality, while those from moisture, and atmospheric substances, possess it in a much lower degree[i]. To solve this problem, and obviate objections, he introduces a new agent, necessity or fate[k], which renders unavoidable the effects ascribed to their volitions; for in all their formations, and in all their operations, he thinks they are entirely guided by the laws which this agent imposes, but then he assures us, that these laws are nothing more than the inherent attributes or properties of the several particles composing the globules. From hence we must infer, that the volitions acquired by the globules, are the effects of the laws of necessity, which at some time or other, though the precise period is not ascertained, were imposed upon their constituent particles.

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[i] "Les globules ou principes qui composent les substances alimentaires provenus des animaux ou des végétaux, ont acquis un grand degré de perfection vitale." P. 248.

[k] "Chaque atome de matiere organique se comporte et agit toujours dans ce vaste univers d'apres les lois qui sont imposées par la necessite, le *fatum*, ou, ce qui est la même chose, par les attributs et les propriétés inhérentes aux diverses substances atmosphériques qui sont entrées dans sa composition." P. 190.

As he thinks that life is merely the effect of organic structure, and that the particles of the solar rays, of heat, and the gases are, when assisted by the laws of necessity, completely adequate to form his globules, so he thinks that the globules, acquiring volitions, instincts, and genius, by successive nutrition, and the laws of necessity, may afterwards be qualified to construct any species of plant or animal when they happen to meet with favourable circumstances, and are compelled by the laws of necessity to acquire the suitable volitions and instincts.

On these principles he treats the idea of preexisting germs as an extravagant and juvenile conceit, unworthy of Haller and Spallanzani, and of the age in which they lived[1]; not knowing, perhaps, or not recollecting when he made this remark, that the idea is by no means of a modern origin: it may be traced to a high antiquity, not only to the "semina rerum" of Lucretius, but the ideas of Plato, and the monads of Pythagoras. But with all the motions, instincts, and volitions, and even those degrees of intelligence and foresight with which our author has endowed his globules, it will be difficult to conceive the manner in which they can construct an animal or plant, without the aid of what Bacon has denominated the regal or the political motion[m]; namely, that motion by which the ruling and predominant parts curb, subdue, regulate, and compel the rest to unite, to separate, to stand still, to move, to arrange, and to place themselves, not according to their own appetites or dispositions, but agreeably to that order of things which is best suited to the interest and welfare of the ruling part; in short, that motion which produces in the body a political government, exercised by the ruling part over the parts which are in subjection to it. Without such a political motion, whether it be the effect of a ruling part, a vital principle, or an archeus, how are the globules, with all their instincts, foresight, and intelligence, in proceeding to form a plant or an animal, to agree or come to a general understanding about the plan on which they are to operate? Suppose them about to form an animal, as a man or a horse: how do they fix on the number of bones, their situations, their relative proportions, their forms, their connexions, their varieties of motion, and the number and adaptation of joints to each of those varieties? As the skeleton, besides, is equally divided by the mesial plane into similar halves, who are to work on the right side, and who on the left, that the two sides may be completed in the same time, consist of the same number of bones, of the same forms, of the same proportions, with the same kinds of articulations? Who, in the mean time, are to be employed on each side in constructing the muscles, in regulating their forms, magnitudes, and numbers, their positions, their connexions, their modes of insertion, their directions of action, and their adaptations in number and proportion to each species of articulation? During these operations, a third kind of globules, divided into pairs, will be required for constructing the brain, the spinal marrow, and their ramifications; a fourth kind, and in six pairs, for constructing the veins, arteries, and lymphatics; a sixth kind for the stomach and other organs of digestion; five additional kinds, and each in two pairs, for the five senses, besides a diversity of other kinds, each in two pairs, and each pair of a different species, for the glands, membranes, ligaments, and cartilages; and besides these, an additional variety for other organs that might be enumerated, all of them too with their several parts of determinate situations, connexions, and functions; of accurate proportions, as to weight, magnitude, and number; all of them forming but one whole, and that whole obedient to one will. Besides, each of all these innumerable globules, in order to perform whatever might be its destined operations, would require a suitable apparatus of organs to execute its plans agreeably to its several instincts and volitions[n]: yet our author has informed us, that he has had incontestible proofs that there is not the vestige of an organ among the whole of them, and that they positively can depend upon nothing but their volitions for motion or action, or for the accomplishment of any one purpose[o].

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[1] "Nous dèvrions, d'après cela, être dispensés de discuter l'opinion si puérile de la préexistence des germes, qui nous parait aussi étrange que peu digne du siécle où elle a prévalu," &c. P. 153.

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[m] “Sit motus decimus sextus, *motus regius* (ita enim eum appellamus) sive politicus; per quem partes in corpore aliquo prædominantes et imperantes, reliquas partes frænant, domant, subigunt, ordinant, et cogunt eas adunari, separari, consistere, moveri, collocari, non ex desideriis suis, sed prout in ordine sit, et conducat ad bene esse partis illius imperantis; adeo ut sit quasi regimen et politia quædam, quam exercet pars regens in partes subditas.” (Bacon, *Novum Organum*, lib. ii. § 48.) This species of motion Paracelsus has entrusted to his archeus; by which he seems to understand a ruler or chief.

In this difficulty, arising from the deficiency of the globules with respect to organs, he is forced to call in another new agent to their assistance. This agent is nature, which he describes as all-powerful, always active, every where present, and of the most profound intelligence and wisdom[p].

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[n] "Enfin je ne puis douter que ces atomes d'une infinie petitesse ne soient doués d'une vie et d'un instinct particuliers qui leur sont propres." P. 35.

[o] "J'ai acquis la preuve qu'ils sont entièrement privés d'organes, que les mouvemens que je leur voyais exécuter leurs sont propres, et qu'il dépend incontestablement de leur volonté de les accélérer ou de les modérer." P. 35.

[p] "La nature toute puissante." P. 289.

"La nature, toujours active, s'empare de chaque atome de matière au moment où il cesse de faire partie d'un tout, elle le modifie, le prépare, et lui assigne bientôt une autre place et d'autres fonctions, qui sont également de peu de durée." P. 261.

"En méditant davantage les phénomènes de la nature, on avait démêlé la sagesse et l'intelligence profondes avec lesquelles elle agit et sait varier les procédés, qu'elle met en usage d'après l'organisation." P. 159.

"Sans nous écarter des lois auxquelles nous avons reconnu que la nature était soumise." P. 305.

With these endowments, so admirably qualified to perform any office, he makes this agent enact laws for the regulation of the different globules, superintend all their operations, and enforce obedience to its injunctions; though in order to prevent it from abusing its power, or committing errors notwithstanding its wisdom, he subjects it to the laws of necessity or fate, which do not belong to any class of beings in the universe of God, but are mere expressions of certain metaphysical abstract ideas of his own creation. We might perhaps be induced to regret that such an intelligent being as nature should be subjected to their tyranny and caprice; but the author immediately relieves us from this anxiety, by assuring us that nature is not a being any more than they, but a simple expression employed by the sages of modern times, to signify the effects necessarily produced by those properties which the Deity has bestowed upon matter, or those properties which fate and necessity throughout the previous part of the essay were said to have bestowed[q]; the author's language, along with the government under which he lived, having been subjected in the course of his inquiries to a revolution. Thus, towards the commencement of his experiments, the months are designated by terms borrowed from the new nomenclature of the French republic; towards the conclusion they resume their old names, as January and February; while the particles of matter which had previously derived all their properties from fate or necessity, now hold them of the Deity, who again is invested with all the attributes of intelligence and wisdom, which had for a time been conferred on that simple expression of effects which is called nature.

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[q] "Nous terminerons cet écrit en disant que la nature, qui était le Protée des anciens, mais qui n'est, pour les sages modernes, que la simple expression des effets que produisent nécessairement les diverses propriétés qui Dieu donna à la matière." P. 315.

This change, however, in the conduct of our author, is confined almost entirely to his language; the general tenor of his ideas is the same; and as fate, necessity, nature, and his deity, are only introduced on rare occasions, when his globules are unable to surmount their difficulties, we must still, on his hypothesis, have recourse to the globules for an explanation of the various processes of organization; and more particularly, as it turns out at last that his deity and nature seem rather to owe their attributes and existence to the globules and their particles, than the globules and their particles any part of their properties or existence to them[r]. The manner in which these globules derive their volition, intelligence, and instinct, from particles in which they were not inherent, is singular and unaccountable; but after constructing the various species of plants and animals, according to the method in which they operated in close vessels, it appears still more extraordinary that they should have foreseen that at some future period a new kind of process might become necessary, and, therefore contrived to divide certain species into sexes, to endow each sex with appropriate instincts, and to fix between the sexes the proportional numbers which would be required in each species, that the species might afterwards be continued by a new process, that of generation. From what motives, from what kind of foresight, or from what mode of general agreement, the globules were induced to substitute this new method for the old, or in what manner, before this new method was adopted, they had been accustomed to perform the duties which are now assigned to the two parents, we are not informed. We are only told that the power which organizes animals and plants, has not been restricted to time or place; that there evidently are plants and animals which did not exist with the plants and animals whose fossil remains have for ages been buried under the earth; that many species of plants and animals which exist at present, are limited by their very structure and functions to the soil and the climates which they inhabit, and must therefore have been originally organized in those very regions which they now occupy. All this may be very true, and yet his conclusion by no means follows, that fate, necessity, his constituent atoms, or his animated globules, should be the organizers of these systems. A real being, endowed with the attributes which he has bestowed on that evanescent phantom of his brain, which he calls nature, and which he confesses to have no existence, except in the sound by which it is expressed, would more easily account for these phenomena than his globules and atoms; not a being however, as he has described it, deriving its existence from the aggregate of the properties and energies of the several atoms composing the universe; not a being to be viewed as the effect rather than the cause of organization; not a being which resides in a sanctuary, and that sanctuary a first principle, an eternal principle of organization of life and motion, and of metamorphosis; not a being, in short, which, after it has been treated as a mockery, is then, in compliance with the fashion of the times, to be styled that supreme intelligence, that first cause, which has always existed, and which ever will; without which nothing has been, and nothing will be; which makes, and which governs whatever is; which pervades and actuates the universe around, the worlds that are balanced over our heads, and the least of the atoms of which they are composed; which is incomprehensible, because there is nothing to which we can compare it; which, in men, the emanations of its mighty power, has laid the foundations of rewards and punishments, by making sensibility and self-love the natural consequences of their organization, and by thus rendering them mutually dependent, has also imposed upon all the necessity of mutual love, aid, and protection, of seeking their happiness in the esteem, and of finding their misery in the contempt of their fellow-creatures[*].

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[r] See note beginning "Nous avons," p. 132 of this Inquiry.

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[*] "C'est dans ce principe éternel d'organisation, de mouvement, de vie et de métamorphose où est le sanctuaire de la divinité, où réside l'intelligence suprême, la cause première qui a toujours existé et qui existera éternellement, sans laquelle rien n'a été et rien ne sera, qui fait et régit tout, qui occupe et remplit l'univers, tous les mondes qui se balancent sur nos têtes, et le plus petit atome; qui est incompréhensible, parce qu'elle ne peut être comparée; qui récompense et punit, puisqu'en organisant les hommes, qui sont une émanation de sa toute-puissance, en leur donnant la sensibilité et l'amour d'eux-memes, en les rendant dépendans les uns des autres, elle leur imposa la nécessité de s'entr' aider, de se secourir mutellement, de s'aimer, et de trouver le bonheur dans l'estime de leur semblables et le malheur dans leur mépris." P. 316.

SECTION III.

OPINIONS OF DARWIN.

ANOTHER writer, more of a poet, and less of a reasoner than the preceding, is the celebrated Darwin; a writer not inferior to Paracelsus, either in the wild eccentricities of fancy, or in his capacity for coining new words[t]. This author, like Fray, supposes that life is gradually acquired by organization, and is always in proportion to the quantity of matter which is organized in any individual[u]. In gratuitously bestowing imaginary qualities on unknown atoms, he far surpasses all his predecessors who have trodden in the paths of physiology. Instead of supposing organic bodies to have been either eternal or created, he rather supposes that they have all been generated; and says he is supported in this hypothesis by some observations in the posthumous works of Mr. Hume, and by a story that was current in antiquity of a mundane egg. From these documents, and from the suggestions of his own fancy, he is induced to believe that the world itself has been generated, and has grown to its present enormous size from a small beginning, like an oak from an acorn, or a whale from a drop of seminal fluid. As to who were its parents, or from what materials it derived its nourishment, he supplies us with no information; and perhaps he had neither leisure nor inclination to be much annoyed with such inquiries.

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[t] See Dr. Darwin's Zoonomia; or the Laws of Organic Life, 3d edit. Lond. 1801, 4 vols. 8vo.

[u] He believes, however, that matter is not the only substance. "The whole of nature," he says, "may be supposed to consist of two essences or substances; one of which may be termed spirit, and the other matter. The former of these possesses the power to commence or produce motion, and the latter to receive and communicate it." Vol. i. p. 1.

Like Fray, he is certain there are no pre-existing monads, or germs, or "semina rerum," or any living organic particles like those of Buffon. The complicated structure of plants and animals he supposes to originate from a single filament[x], which, when the species is divided into sexes, is furnished by the male. To enable this filament, which, in his fancy, is the extremity of a nerve of loco-motion[y], to collect and arrange the nutritive particles with a regular system of organs, he thinks proper to endow it "with certain capabilities of irritation, sensation, volition, and association; and also with some acquired habits or propensities peculiar to the parent[z];" which habits and propensities may, he avers, have "gradually been acquired during a million of generations, even from the infancy of the habitable earth[a]." At the same time, with every "new organization, or accretion of parts, new kinds of irritabilities may commence, for so long as there was but one living organ, it could only be supposed to possess irritability[b]. A most singular opinion, when compared with his former notions; namely, that the living filament, at the earliest period of its separate existence, even when secreted from the blood of the male, had certain capabilities, not only of irritation, but of sensation, volition, association[c]; that by means of these capabilities, and acquired habits, it was, like a gland, enabled to perceive, to collect, and to combine, the particles of nutrition[d]; being guided and assisted in its operations by pleasureable and disagreeable feelings[e]; by formative appetencies, and by the vitality of the nutritive particles, which, in order to facilitate the mutual coalescence, are also endowed with formative propensities[f].

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[x] Borrowed from Needham. See above, p. 129.

[y] Vol. ii. p. 221.

[z] Ibid. p. 200.

[a] Ibid. p. 273.

From another conjecture that these formative appetencies and formative propensities, with the other properties bestowed on the filament, might vary their actions with a change of circumstances, and, according to circumstances, produce a variety of structures, his imagination is strongly inclined, though with some diffidence, to take a loftier and a bolder flight, and even to suppose that warm-blooded animals of every description might originally have sprung from one sort of filament, fishes from another, and plants from a third[g]; when soaring again, in another flight still loftier, he perceives that all organized bodies whatever might originally have sprung from the same sort of filament, or, to express it in his own words, " that one and the same kind of filament is, and has been the cause of all organic life [h]."

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[b] Vol. ii. p. 221. [c] Ibid. p. 220. [d] P. 259.
[e] P. 201-2. [f] P. 289. [g] P. 281.

Now, admitting this hypothesis, but taking the filaments as at present modified, divided into almost innumerable species, and each species with permanent characters accurately defined, with several varieties of forms and qualities, and of what he denominates irritabilities, sensibilities, voluntarities, associabilities, formative appetencies, formative propensities, besides a number of embraces and repulsions which he has ascribed to them [i]; it must appear somewhat extraordinary, that he has not entrusted a single filament with the plan or design of the complicated structure which they are to execute, but has left them to operate entirely at random, or according to circumstances; and as circumstances, it seems, may induce the same filament to form all sorts of organic structures observable in the animal or vegetable kingdoms, the reader is left in astonishment that a filament, from any particular species, so regularly generates its own kind, and no other; and he may again have reason to wonder how the circumstances that chiefly preside in regulating the plan on which the molecules and fibrils are to operate, should not also inform them where they are to operate, at the head or the foot, on the right side or the left; and farther, in what particular employment they are to be engaged, whether in constructing bones or muscles, nerves, arteries, veins, or lymphatics, glands, membranes, ligaments, or cartilages. But, notwithstanding his other liberal and extensive endowments, he has left the whole of them entirely unprovided with any information upon these subjects; he has left them also in an equal state of uncertainty and ignorance with respect to the forms, numbers, and sizes, connections, positions, and proportions of the organs that ought to be constructed. Nay, so far from giving either his filaments, his nutritive particles, or his existing circumstances, that degree of intelligence and foresight necessary to qualify them for organizing a complicated structure, and for adapting it to those varied and intricate relations of other circumstances in which it is to act, he has not condescended to endow any of them with even a particle of common understanding, or offered to assist them with the laws of fate or necessity, the wisdom of nature, or the providence of a deity.

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[h] From p. 240 to p. 244.

[i] P. 230.

On the other hand, by ascribing to each certain degrees of irritation, sensation, volition, and association, he evidently subjects them by his hypothesis to a considerable number of diseases, as all diseases, agreeably to his system of nosology, must proceed ultimately from one or other of the above sources; those arranged under irritation being divided into three orders, thirteen genera, and one hundred and eighty-five species; those under sensation into three orders, ten genera, and one hundred and twenty-three species; those under volition into two orders, four genera, and sixty species; and those under association into three orders, twelve genera, and one hundred and four species. The specific diseases of the human organism, exclusive of varieties and combinations, amount in this way to no fewer than four hundred and seventy-two; and yet that number must certainly appear comparatively small, considering that the many millions of particles of which the human organism is composed, have, besides those which are common to the whole, many irritations, sensations, volitions, and associations peculiar to themselves.

If redundancy of fancy, novelty of terms, unbounded extravagance of supposition, and multitudes of theories, with numerous facts, curious and important, but ill-arranged and ill-understood, were to recommend the Zoonomia, it should certainly stand high in the public opinion. But, unfortunately, the author keeps no one object steadily in view, to guide his researches. Constantly illustrating his facts by fictions, and his fictions by facts, he assumes while a poet the air of a philosopher, and while a philosopher the air of a poet, until he leaves his astonished reader as much benighted, bewildered, and confounded, as he seems to be himself.

SECTION IV.

ALL ANIMAL AND VEGETABLE ORGANISMS SUPPOSED TO BE COEVAL, AND GENERATION TO BE ONLY A PROCESS OF DEVELOPMENT OR EXPANSION.

OTHER writers of as sound a judgment, of as deep reflection, of as general information, of more originality, and of more philosophical habits of thinking, than Darwin or Fray[k], finding themselves unable to conceive how matter, by any of its obvious or acknowledged properties, could produce organization or any other phenomenon of life, have had recourse, in imitation of many of the ancients, to various species of organized atoms, which, though naturally invisible, have however been waiting for thousands of years for favourable circumstances, to enable them to expand into animals or plants. Among those who in modern times have adopted this hypothesis, have supported it by most observations or experiments, or who have shown the greatest ingenuity in obviating the objections to which it is liable, I may mention Leibnitz, Haller, Bonnet, Spallanzani, and Priestley. The same hypothesis had previously occurred to Leeuwenhoek, Hartsoeker, Claude Perrault, and Cardinal Polignac. In some it was the result of reasoning[1], in others the effect of accidental microscopic observation. Polignac seems to have a-

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[k] The reader who studies the theories of Buffon upon generation and reproduction, or the theories of Needham and Spallanzani, with the numerous experiments on which they were founded, will not ascribe much originality to the reasonings or fancies of these two writers. In many of their speculations, they are likewise anticipated by Maupertuis.

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[1] "Tout le danger que je cours en prenant une nouvelle hypothese, est de m'égarer dans une route, *qui n'a point encore été suivie;* mais je ne crois pas qu'on me doive blâmer, si cela m'arrive; puisque dans les autres toutes battues qu'elles sont on ne laisse pas de s'égarer, parce qu'elles ne conduisent point où l'on vouloit aller, toutes les hypotheses des facultez formatrices, ou de la rencontre fortuïte des matieres diversement disposées à recevoir des figures differentes par la rarefaction, par la condensation, par l'exsiccation ou coagulation des unes, et par la ductilité des autres, ne pouvant conduire à la clarté et à l'évidence que l'on cherche.

" Mon hypothese est donc, que dans la création du monde les corps ont eu deux sortes de formes; qu'aux uns la forme a été donnée très simple et seulement similaire, et que les autres en ont eu une très composée et organique. Que les corps du premier genre sont les elemens, qui par leurs differentes liaisons font des mixtes capables de devenir la nourriture des plantes, de même que les plantes sont faites pour nourrir les animaux. Que les corps du second genre sont les corps capables d'avoir vie, fournis de tous les organes nécessaires à leurs fonctions, mais tellement petits qu'il leur est impossible d'en exercer aucune; et qu'en cet état étant mêlez parmi les corps inanimez ils attendent l'occasion de rencontrer une substance assez subtile et disposée comme il faut pour penetrer les conduits étroits de leurs petits organes, et les rendre propres à recevoir la nourriture qui leur doit faire aquerir une grandeur convenable: et alors il leur arrive ce que l'on appelle genera-

dopted the hypothesis in consequence of the many allusions to it in Lucretius and the sacred records[m]. From the circumstance alone of its having thus occurred to so many learned and ingenious men, ancient and modern, independ-

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tion, qui n'est rien autre chose que ce qui rend ces petits corps capables de recevoir la nourriture par l'ouverture et le developpement de leurs parties serrées les unes contre les autres. - - -

“ Ceux qui auront fait reflexion sur la grande étendue de la divisibilité des corps, et sur l'extrême petitesse des animaux actuellement vivans dans des liqueurs qui paroissent très pures et très simples, n'auront pas de peine à demeurer d'accord de la possibilité qu'il y a à comprendre, que ces petits corps organizez et non encore vivans, beaucoup plus petits que ne sont ceux qui se voyent avec les nouveaux microscopes, peuvent être mêlez dans tout le monde, en sorte qu'il y en ait par-tout de toutes les especes, tant des plantes que des animaux possibles.” *La Mechanique des Animaux: Oeuvres Diverses de Physique et de Mechanique, de Messieurs C. et P. Perrault,* p. 481. Leide, 1721, 4to.

[m] “ Semina sic teneris dormitant abdita rebus,
Donec robur ea, et juvenilis concitet ardor. - - -
Ante quiescebant; nunc omni ex parte moventur:
Nunc res dicuntur; sed erant compendia rerum.
Haud secus ille elephas, qui tergo pondera tanta
Sustinet, ac turres armisque virisque refertas,
Textilis instar equi periit quo prodita Troja,
Nascens parvus erat; minimus quoque matris in alvo.
At quanto minor in lumbis fuit ille paternis?
In lumbis et avi et proavi? Tamen unus et idem.
Aspice sublimi ferientem sidera quercum
Vertice, rimantem radicibus infera regna,
Umbrantem patulo ramorum tegmine terras,
Et qualem Assyrio monstrarunt somnia regi;
Glans fuit, aut potius pars exilissima glandis, - - -

ently of those numerous experiments, observations, and reasonings, by which they have severally attempted to defend it, we cannot presume to treat it with either ridicule or neglect, and therefore shall examine it with that attention to which the authorities by which it comes so warmly recommended seem to entitle it. Unfortunately for the respect which it claims, while its friends appear to be unanimous concerning the pre-existence of germs, or *semina rerum*, they differ most widely with regard to their nature, the place of their abode, the means in which they continue to exist, and the mode by which they are afterwards expanded. These differences are obvious on comparing the peculiar sentiments of the writers, who, in supporting the general opinion, venture into any particular detail.

Haud aliter gens Hebræûm numerosior astris,
Quæ Syriæ fines olim ditione tenebat,
Nunc servit late totum diffusa per orbem,
Abramo simul in puero sata constitit omnis;
Et dum vagiret, cunis requievit in iisdem.

Polignac, *Anti-Lucretius*, lib. vii. v. 1267, *seq.*

SECTION V.

OPINIONS OF LEIBNITZ.

Leibnitz, a man of great learning, ingenuity and acumen, from occasionally combining modern ideas with those borrowed from the ἰδέαι of Plato, the monads of Pythagoras, and the abstruse dialectics of Aristotle, has formed a hypothesis not easily comprehended by those who are strangers to abstract speculation.

According to Leibnitz, there are certain substances distinct from matter, and which he thinks may be termed souls, entelecheias[n], primitive forces, substantial forms, simple substances, or monads. These substances, which are supposed to be naturally imperishable, and of which the primitive forces are always the same, exhibit a variety of other forces which are styled derivative; the derivative being the modifications of the primitive forces, as figures are modifications of matter[o]. All these simple substances, or monads, which with him is their more usual appellation, are essentially active, have within themselves the power of generating motion, have also a certain degree of perception, a tendency to exertion, and an analogy to what are called spirits; while matter, on the contrary, is entirely passive, and acts only when acted upon [p]. In a general sense, the Deity himself may be called a monad, and he is said to be the dominant monad of the universe. Of all monads he is the only one that is uncreated, that is self-existent, eternal, omniscient, infinitely powerful, just, and good; the only one that is without a body, or corporeal nature. Even all his angels are invested with bodies, although of a kind more subtile than ours [q]. And

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[n] Ἐντελέχειαι. See above, p. 5.

[o] " Je soutiens que toutes les ames, entelechies ou forces primitives, formes substantielles, substances simples, ou monades, de quelque nom qu'on les puisse appeller, ne sauroient naître naturellement ne périr. Et je conçois les qualités ou les forces dérivatives, ou ce qu'on appelle formes accidentelles, comme des modifications de l'entelechie primitive; de même que les figures

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sont des modifications de la matière. C'est pourquoi ces modifications sont dans un changement perpétuel, pendant que la substance simple demeure." *Essais de Theodicée sur la Bonté de Dieu, la Liberté de l'Homme, et l'Origine du Mal,* par M. Leibnitz, p. 384. Amsterdam, 1720, 12mo.

[p] "Il est vrai que la forme ou l'ame a cet avantage sur la matière, qu'elle est la source de l'action, ayant en soi le principe du mouvement ou du changement; en un mot, *το αυτοκίνητον*, comme Platon l'appelle; au lieu que la matière est seulement passive, et a besoin d'être poussée pour agir, *agitur ut agat:* mais si l'ame est active par elle-même (comme elle l'est en effet) c'est pour cela même qu'elle n'est pas de soi absolument indifférente à l'action, comme la matière, et qu'elle doit trouver en soi de quoi se déterminer." *Theodicée,* p. 332.

"J'y fais voir que naturellement chaque substance simple a de la perception," &c. *Theodicée,* p. 309.

[q] "Il y a encore une autre différence dans mon système entre Dieu et les esprits créés; c'est qu'il faut à mon avis que tous les esprits créés ayent des corps, tout comme notre ame

all these angels and inferior monads owe their creation entirely to him; and all depend upon him every moment for their existence; their preservation being nothing more than one continued or repeated creation[r].

A monad, in its first stage of existence, when it has only an obscure perception, is properly an

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en a un." *Nouveaux Essais sur l'Entendement Humain: Oeuvres Philosophiques de feu Mr. Leibnitz*, p. 265. Amsterdam et Leipzig, 1765, 4to. "Je crois que les sçavans peres de l'eglise ont eu raison d'attribuer des corps aux anges." *Ibid.* p. 179.

"Ces anges ou ces substances agissent selon les loix ordinaires de leur nature, étant jointes à des corps plus subtils et plus vigoureux que ceux que nous pouvont manier." *Theodicée*, p. 277.

"C'est ce qui fait que dans ma philosophie il n'y a point de créature raisonnable sans quelque corps organique, et qu'il n'y a point d'esprit créé qui soit entierement détaché de la matière. Mais ces corps organiques ne different pas moins en perfection, que les esprits à qui ils appartiennent. Donc puis-qu'il faut à la sagesse de Dieu un monde de corps, un monde de substances capables de perception et incapables de raison," &c. *Theodicée*, p. 169.

[r] "J'ai montré, *a posteriori*, par l'harmonie préëtablie, que toutes les monades ont reçu leur origine de Dieu et en dependent. Cependant on n'en sauroit comprendre le comment en detail; et dans le fonds leur conservation n'est autre chose qu'une creation continuelle, comme les scholastiques l'ont fort bien reconnu." *Nouveaux Essais*, p. 410.

"Actualia dependent a Deo tum in existendo tum in agendo, nec tantum ab intellectu ejus sed etiam a voluntate. Et quidem in *existendo*, dum omnes res a Deo libere sunt creatæ, atque etiam a Deo conservantur; neque male docetur conservationem divinam esse continuatam creationem, ut radius continue a sole prodit; etsi creaturæ neque ex Dei essentia, neque necessario promanent." *Causa Dei asserta: Theodicée*, p. 492.

entelécheia. If it be of a species which arrives in its progress at distinct perceptions, so as to be able to reason and to think, it assumes the name of soul or spirit[s], the nature of which is more easily comprehended than that of body, which, by an absurdity approaching almost to a contradiction, is said to be divisible ad infinitum.

Every monad has a tendency to rise through a series of gradations to a higher rank in the scale of being, though in this progress there is no transmigration like that of the ancients, but only successive modifications of the primitive powers and the bodily figure. These powers, and a part of the body, remain united even after death; for all monads being indestructible, or perishable only by annihilation, death and generation can imply no more than new or additional modifications of their primary qualities[t].

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[s] "Les entelechies, c'est à dire les tendances primitives ou substantielles, lorsqu'elles sont accompagnées de perception, *sont les ames*." *Nouveaux Essais*, p. 128.

"Aristote et l'ecole après lui ont appellé *forme*, ce qui est un principe de l'action, et se trouve dans celui qui agit. Ce principe interne est, ou substantiel, qui est appellé *ame*, quand il est dans un corps organique; ou accidentel, qu'on a coutume d'appeller *qualité*. - - - J'ai montré aussi comment on peut concevoir que l'ame est une force primitive, qui est modifiée et variée par les forces derivatives ou qualités, et exercée dans lés actions." *Theodicée*, p. 130.

"Que nous entendons la nature de l'esprit autant ou mieux que celle du corps, est tres vrai." *Nouveaux Essais*, p. 184.

[t] "Le corps est dans un flux continuel, et l'ame n'habite pas dans certains atomes affectés à elle, ni dans un petit os indomtable, tel que le *Luz* des Rabbins. Cependant il n'y a point de *transmigration* par laquelle l'ame quitte entièrement

In ascending through the gradations of the scale, the succession and series of transformations are in each species determinate and regular, so that no monad, of whatever species, however near it approaches to another of a diffent species, can assume either its powers or its forms [u]. To what extent these transformations are ultimately carried, is not specified; but Leibnitz is inclined to suppose, that wherever they may stop, their tendency is to advance the monads, by insensible degrees, to-

son corps et passe dans un autre. Elle garde toujours, même dans la mort, un corps organisé, partie du précedent, quoique ce qu'elle garde soit toujours sujet à se dissiper insensiblement et à se reparer et même à souffrir en certain tems un grand changement. Ainsi au lieu d'une transmigration de l'ame, il y a transformation, enveloppement ou developpement, et enfin fluxion du corps de cette ame." *Nouv. Essais,* p. 191.

"Je tiens que les ames, et generalement les substances simples, ne sauroient commencer que par la création, ni finir que par l'annihilation: et comme la formation des corps organiques animés ne paroit explicable dans l'ordre de la nature, que lors-qu'on suppose une préformation déja organique, j'en ai inferé que ce que nous appellons generation d'un animal n'est qu'une transformation et augmentation - - - et que la mort apparente n'est qu'un enveloppement." *Theodicée,* p. 134.

[u] "Si nous avions la penetration de quelques genies superieurs et connoissions assez les choses, peût-être y trouverions-nous des attributs fixes pour chaque espece, communs à tous ses individus et toujours subsistans dans le même vivant organique, quelques alterations ou transformations lui puissent arriver." *Nouv. Ess.* p. 270.

"Cependant pour l'ordinaire il n'y a rien de tel à craindre, les especes trop approchantes ne se trouvent gueres ensemble." *Nouv. Ess.* p. 281.

wards the infinite perfection of the deity[x]. And considering the varied and numerous gradations between the lowest monad and man, he thinks the number may be infinitely greater between man and the sovereign of the universe; a sentiment which seems to imply, that he had an obscure perception of that ascending gradation of worlds, in some of which, as Bonnet supposes, the rocks exhibit organized structures, plants feel, brutes reason, and men appear in the rank of angels[y].

In ascending through these various gradations, the organic structure and powers of the monad, in order that the one may be accurately suited to the other, must always preserve the same relation through every successive modification[z]; and yet in these changes, according to Leibnitz, there is no kind of mutual reaction between what is immaterial and what is material: each is developed by laws of its own, totally independent of the laws of the other[a]; they are two separate and distinct automatons, the one spiritual, the other corporeal[b]; yet not automatons of such a nature as to exclude free agency in man, or to implicate the

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[x] "Lorsque nous considerons la sagesse et la puissance infinie de l'auteur de toutes choses, nous avons sujet de penser, que c'est une chose conforme à la somptueuse *harmonie de l'univers* et au grand dessein aussi bien qu'à la bonté infinie de ce souverain architecte, que les differentes especes des creatures s'elevent aussi peu à peu depuis nous vers son infinie perfection. Ainsi nous avons raison de nous persuader qu'il y a beaucoup plus d'especes de creatures au-dessus de nous qu'il n'y en a au-dessous, parce que nous sommes beaucoup plus eloignés en degrés de perfection de l'etre infini de Dieu, que de ce qui approche le plus près du néant." *Nouv. Essais*, p. 266.

[y] "Dans ces derniers mondes les roches sont organisés, les plantes sentent, les animaux raisonnent, les hommes sont anges." Bonnet, *Contemplation de la Nature*, p. ii. chap. vi.

[z] "Dieu a accommodé le corps à l'ame - - - et l'ame au corps, en sorte que l'ame se laisse incliner par les passions qui naissent des representations corporelles: ce que fait le même effet et la

même apparence que si l'un dépendoit de l'autre immédiatement, et par le moyen d'une influence physique." *Theodicée*, p. 116.

[a] " L'ame et la machine - - - s'accordent parfaitement, et quoiqu'elles n'ayent point d'influence immediate l'une sur l'autre, elles s'expriment mutuellement, l'une ayant concentré dans une parfaite unité tout ce que l'autre a dispensé dans la multitude." *Nouv. Essais*, p. 278.

" L'harmonie des ames et des corps, qui fait que chacun suit parfaitement ses propres loix sans être troublé par l'autre, et sans que le volontaire ou l'involontaire y doivent être distingués." *Nouv. Essais*, p. 441.

" Sans qu'elle [l'ame] ait besoin de recevoir aucune influence physique du corps: comme le corps aussi de son côté s'accommode aux volontés de l'ame par ses propres loix, et par consequent lui obéït, qu'autant que ces loix le portent. D'où il s'ensuique l'ame a donc en elle-même une parfaite spontaneité, en sorte qu'elle ne dépend que de Dieu, et d'elle-même dans ses actions." *Theodicée*, p. 310.

[b] " Comme le fœtus se forme dans l'animal, comme mille autres merveilles de la nature sont produites par un certain *instinct* que Dieu y a mis, c'est à dire en vertu de la *préformation divine*, qui a fait ces admirables automates, propres à produire mécaniquement de si beaux effets; il est aisé de juger de même que l'ame est un automate spirituel, encore plus admirable; et que c'est par la préformation divine qu'elle produit ces belles idées, où notre volonté n'a point de part, et où notre art ne sauroit atteindre." *Theod.* p. 389.

deity in his follies or his crimes [e]. Volitions have no influence on actions, nor actions on volitions; final causes have no control over the efficient, nor external circumstances any power in directing the spontaneities, or the original principles of exertion. All these phenomena are represented as the result of a pre-established order of harmony, which, in his philosophy, is made to account for most of the appearances which others have ascribed to what they denominate cause and effect. The whole rests on the wisdom, the will, and the power of the deity, who, although he is made to act from necessity, acts not from the blind impulse of fate but from the dictates of his own nature and his own understanding, that suggest the plans on which he displays his wisdom and goodness; in short, he acts from all-sufficient reasons, or from that species of necessity, without which he could not be considered as wise or good, or as infinitely perfect [d].

From the novelty, however, of this harmony, from the extent and from the varieties of its application, from its limits not being accurately defined, and from the difficulty of contracting new habits of thinking, it becomes no easy matter for the reader to explain phenomena upon such a principle. Thus, for example, he may not see, after all his reflection, how this pre-established order of harmony should render it necessary to refuse the character of substance to matter, to conceive all matter to be organized, to have every portion connected with a monad, without which it is not to subsist, and yet that monad not to be permitted to act upon it, nor it upon the monad[e]. From the active and incessant efforts of the monad to change its condition, and the passive nature of its corporeal organized structure, one might almost be led to conclude, that what is so active would have some influence on what is so passive, notwithstanding the total want of relation between what is immaterial and what is corporeal; a difference which is thought to prevent fire from acting on detached incorporeal spirits in the regions below[f]. But if there be something in the nature of the soul which corresponds to the circulation and motions of the viscera, may there not also be in every monad some active powers which not only correspond with, but also regulate, the functions of its organs[g]? The want of relation to which Leibnitz alludes, does not prevent the purest of spirits, and one that is every way totally exempted from organic structure[h], from acting upon matter: on his own hypothesis, the deity not only acts upon matter, but has also created it, and constructed out of it all the innumerable species of organisms which have been required, or which may be required, for the varying powers of all the different and innumerable species of minerals, plants, animals, and angels; nay, has not only created it ages ago, but in order to preserve it, together with its organisms, has continued every moment to create them[i], although myriads of organisms, and entelecheias, and more than ten thousands of myriads of men and of beasts, have never, from the first of their numerous creations, had an opportunity of further development[k].

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[e] "Ceux qui sont d'un autre sentiment, et qui font Dieu seul acteur, s'embarassent sans sujet dans des expressions, dont ils auront bien de la peine à se tirer sans choquer la religion; outre qu'ils choquent absolument la raison." *Theod.* p. 387.

[d] "Ce pretendu *fatum*, qui oblige même la Divinité, n'est autre chose que la propre nature de Dieu, son propre entendement qui fournit les regles à sa sagesse et à sa bonté; c'est une heureuse necessité, sans laquelle il ne seroit ni bon ni sage. Voudroit-on que Dieu ne fût point obligé d'être parfait et heureux?" *Theod.* p. 233.

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[e] "Quant au mouvement, ce n'est qu'un phenomene réel, parce que la matière et la masse, a laquelle appartient le mouvement, n'est pas à proprement parler une substance. Cependant il y a une image de l'action dans le mouvement, comme il y a une image de la substance dans la masse. - - - Je ne donne aux corps qu'une image de la substance et de l'action, parceque ce qui est composé de parties ne sauroit passer a parler exactement pour *une* substance non plus qu'un troupeau." *Nouv. Essais*, p. 170.

"La matière ne sauroit subsister sans substances immaterielles, c'est à dire, sans les unités." *Nouv. Ess.* p. 344.

"Je vois toutes choses reglées et ornées au delà de tout ce qu'on a conçu, jusqu'ici; la matière organique part tout, rien de vuide, de sterile, ou de negligé," &c. *Nouv. Ess.* p. 28.

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[f] "Il n'y a point de proportion entre une substance incorporelle et une telle ou telle modification de la matière." *Nouv. Essais,* p. 73.

"Certains Theologiens pretendent que le feu de l'enfer brule les ames separées; en quel cas l'on peut même douter si ce seroit le feu qui agiroit, et si Dieu ne feroit pas lui même l'effet en agissant au lieu du feu." *Nouv. Essais,* p. 344.

[g] "Puisque je crois qu'il y a toujours une exacte correspondance entre le corps et l'ame, et puisque je me sers des impressions du corps, dont on ne s'apperçoit pas soit en veillant soit en dormant, pour prouver que l'ame en a de semblables. Je tiens même qu'il se passe quelque chose dans l'ame, qui repond à la circulation du sang et à tous les mouvemens internes des visceres." *Nouv. Essais,* p. 73.

[h] "Je crois que les bêtes ont des ames imperissables, et que les ames humaines et toutes les autres ne sont jamais sans quelque corps: je tiens même que Dieu seul, comme étant un acte pur, en est entièrement exempt." *Nouv. Ess.* p. 70.

If it should be thought that I have bestowed unnecessary labour in collecting the sentiments of Leibnitz concerning his monads, it must be recollected that the learned Brucker, his abridger Enfield, and Saverien, who have each written an account of his life, writings, and philosophy, have not been sufficiently explicit respecting their organic or corporeal structure. Thus Enfield, while he is directing his attention to their immaterial and active principle, which Leibnitz says may be termed their soul, their entelecheia, or substantial form, supposes them to be of a nature similar to the ἰδέαι of Plato, the substantial forms of Aristotle[l], or the intelligible natures of Pythagoras, denominated numbers: but viewing them again as if they were the ultimate particles of matter, possessing the properties of motion and life, he observes that they differ from the solid and indivisible atoms of Epicurus [m]. Now here is a singular confusion of ideas, though not more singular than what we find in a late inquiry concerning causation, where the author, overlooking the corporeal structure which belongs to each monad, is surprised how Leibnitz could have supposed that substances without figure or parts could give to bodies any forms which they had not to bestow; and how bodies, by nature inactive and incapable of feeling, should be made up of substances essentially active, and possessed of perception [n]. Had this author attended to the language of Leibnitz, and employed his usual discrimination, he could never have ascribed to him such inconsistencies. It is true, that in using the word monad, Leibnitz does not always strictly confine it to the same meaning. For although he has shewn, and shewn repeatedly, that, properly speaking it is only applicable to the active unit, the entelecheia, yet he often extends it to signify both the entelecheia, and its corporeal organized envelope. This is what seems to have led Mr. Scott, though I think unwarrantably, to infer, that Leibnitz has confounded thought and extension, activity and inertia. Such opinions are expressly disavowed by that distinguished philosopher; nay, the whole of his reasoning is founded upon an opposite hypothesis. If I were to make use of the following expression, "the man who reasoned, thought, and remembered, was afterwards drowned," would any one conclude that I therefore confounded body and soul, and either believed, or meant to insinuate, that the soul, which reasoned, thought, and remembered, was that very substance which was afterwards drowned? Not only in conversation, but in writing we employ the term *man*, sometimes to signify the thinking principle, sometimes the body in which it resides, and sometimes to signify them both together. Now what is man in the theory of Leibnitz, but a species of monad in a state of development? And because the soul is without figure and without parts, does it therefore follow that the body should also be without figure and parts? As in his theory no matter can subsist by itself[o], as all matter is necessarily organized, as all organized matter is necessarily connected with some entelecheia, and as no entelecheia or active principle excepting the deity is without a body, the developed bodies of plants and animals are formed of the bodies of entelecheias, or the bodies of monads of the same species, which one day may also have a chance of being developed in the same way as the plant or animal of which they are now the component parts. During the development, the entelecheia and the body of the monad are expanded differently; the entelecheia, by the mere expansion of its primitive powers, continuing to the last as much a unit as it was at first; the body on the contrary by incorporation, or by the accession of the bodies of monads of the same species, which are in a state of constant fluctuation [p].

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[i] See page 155, note r.

[k] "C'est depuis que j'ai médité ce systeme, que j'ai trouvé comment les ames des bêtes et leurs sensations ne nuisent point à l'immortalité des ames humaines, ou plûtôt comment rien n'est plus propre à établir nôtre immortalité naturelle, que de concevoir que toutes les ames sont imperissables (*morte carent animæ*) sans qu'il y ait pourtant des metempsicoses à craindre, puis que non seulement les ames mais encore les animaux demeurent et demeureront vivans, sentans, agissans." *Nouv. Ess.* p. 28.

[l] See p. 156.

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[m] "It will be easily perceived, that the monads of Leibnitz approach nearer to the permanent intelligible natures, called by Pythogoras numbers, and by Plato ideas, than to the solid and indivisible atoms of Epicurus." Enfield's *History of Philosophy*, vol. ii. p. 565.

[n] "Leibnitz supposes his monads, of which all bodies are made up, to be essentially active, and to be possessed of perception or sensation. But it is contrary to every thing that we know of the nature of bodies to be endowed with such qualities. Body is by its nature inactive, and incapable of feeling; mind alone can act, perceive, and think; by confounding together qualities so opposite in their kind, truth can never be advanced, and confusion and absurdity are the inevitable consequence." Scott's *Inquiry into the Limits and peculiar Objects of Physical and Metaphysical Science, tending principally to illustrate the Nature of Causation*, p. 144. Edinb. 1810, 8vo.

With respect to the primary bodies of entelecheias, Leibnitz does not reason with the same perspicuity or consistency. In his opinion, they are not mixed or aggregate bodies, and yet are organized. A part of them is thought to continue after death, and to accompany its entelecheia, which seems to imply that they are divisible[q]. Their identity consists not in the sameness of parts, but in something equivalent; their parts, like the waters forming a river, are changing every moment[r]. They are all material, or composed of matter; but matter is only a mass or collection of an indefinite number of beings[s], each of which, somewhat like an animal, is endowed with a soul, or at least with a species of active principle, which seems to be analagous, and which properly constitutes real unity, while in order to be passive, as well as active, it must necessarily have an organized body. The question then which remains to be solved is, of what parts is the primary body of any entelecheia composed? Solid atoms, without an internal principle of change, are pronounced by Leibnitz to be a chimera[t]. The atoms, therefore, which would seem to form the primary bodies of entelecheias, must be such as have within them a principle of change, namely, the bodies of other monads or entelecheias; and hence the smallest body of a monad will be composed of the bodies of monads that are smaller than the smallest; an idea which implies as gross an absurdity as the infinite divisibility of matter[u].

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[o] See above, p. 161.

[p] "En' effet le corps organisé n'est pas le même au delà d'un moment; il n'est qu' equivalent.—Ainsi cette identité ne seroit qu' apparente.—C'est à peu prés comme un fleuve, qui change toujours d'eau, ou comme le navire de Thesée, que les Atheniens reparoient toujours." *Nouv. Ess.* p. 190, 191.—"Il faut toujours, qu'outre la difference du tems et du lieu il y ait an *principe* interne *de distinction.*" *Nouv. Ess.* p. 188.—"Le precis de *l'identité* et de la *diversité* ne consiste donc pas dans le tems et dans le lieu, quoiqu'il soit vrai, que la diversité des choses est accompagnée de celle du tems et du lieu." *Nouv. Ess.* p. 189.

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[q] See note *t*, p. 156.

[r] See p. 166, note p.

[s] "C'est encore une importante remarque sur la matière, que celle que L'Auteur [Locke] fait ici, qu'on ne la doit point prendre pour une chose unique en nombre, ou (comme j'ai coûtume de parler) pour une vraye et parfaite *monade* ou *unité*, puisqu'elle n'est qu'un *amas* d'un nombre infini d'etres. Il ne falloit ici qu'un pas à cet excellent auteur pour parvenir à mon systême. Car en effet je donne de la perception à tous ces etres infinis, dont chacun est comme un animal, doué d'ame (ou de quelque principe actif analogique, qui en fait la vraye unité) avec ce qu'il faut à cet etre pour être passif et doué d'un corps organique. Or ces etres ont reçu leur nature tant active que passive (c'est a dire, ce qu'ils ont d'immateriel et de materiel) d'une cause generale et supreme," &c. *Nouv. Essais*, p. 406.

The mode in which Leibnitz describes the primary bodies of entelecheias, and in which he developes them by a pre-established order of harmony, is peculiar to himself; but in other particulars he evidently adopts the opinions of Swammerdam, Hartsoeker, Leeuwenhoek, and other microscopic observers, who have seen these bodies somewhat enlarged, moving in the seminal fluid of the male, or taking up their residence in the ovaries of the female[x]. Till this partial development, they had remained totally invisible either in the loins or some other part of the body; and as the bodies of the first parents are, on this hypothesis, supposed to have contained all the millions and the hundreds of millions that have since been developed by succeeding generations, they must have been of gigantic dimensions when compared with their offspring of the present day.

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[t] "La notion des atomes est chimerique, et ne vient que de conceptions incomplettes des hommes. Car s'il y avoit des atomes, c'est à dire des corps parfaitement durs et parfaitement inalterables ou incapables de changement interne et ne pouvant differer entre eux que de grandeur et de figure, il est manifeste qu'étant possible qu'ils soyent de même figure et grandeur, il y en auroit alors d'indistinguables en soi, et qui ne pourroient etre discernés que par des denominations exterieurs sans fondement interne, ce qui est contre les plus grands principes de la raison." *Nouv. Essais*, p. 189.

[u] According to Leibnitz, "every portion of matter may be conceived to be a world of living creatures, and every part of a living body to be itself full of other living bodies." Enfield, vol. ii. p. 564.

But here it may be asked, on what principle does Leibnitz presume to limit the creative power of the deity to a definite time or to a definite number of specific organisms? Even granting that preservation is only a continued act of creation[y], is his power to be limited to the mere preservation of what he has made? Who is so deep in the secrets of his counsels as to say with confidence, that he may not yet create a new heaven and a new earth, and that a successive series of creations has not been predetermined from the beginning? He who said, let there be light, and there was light, performed an act which implied no exertion, occasioned no fatigue, and required no repose. What he wills is done; and when he ceases to will, it is because his will is accomplished, and not because he requires rest[z]. We are too apt to fancy the deity similar to ourselves. He "that eateth his bread in the sweat of his face," may often be inclined to slumber and sleep; but he is not thence to suppose that the deity either slumbers or sleeps. The labourer and slave may envy the situation of their superintendent; but can such a situation be an object of envy with him who is infinitely raised above all? The superintendent may as naturally envy the situation of his employer, who, retired from the bustle of active life, is surrounded with comforts, and enjoying *otium cum dignitate*, like the gods of Epicurus; but is that the most dignified and exalted situation in which we can suppose the sovereign of the universe? A piece of machinery brought to such a high state of perfection as to require no further improvement, may reflect much credit on the artist, and relieve him from much anxiety and trouble; but had the deity anxiety or trouble in constructing the universe; or can he that neither faints nor is weary[a], feel any anxiety or care in supporting it? These comparisons may be well suited to the weakness of our intellect, but are ill calculated to convey any adequate idea of the nature of deity; and yet upon such vague analogies is it supposed that he rested from his labours; that he has no intention of willing any new creations; that he is only the superintendent of the fabric of the universe which he has constructed; and that, trusting to the certainty and precision of its operations, he is never concerned in its movements, except when he occasionally interposes to perform what we denominate a miracle.

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[x] "Ainsi je croirois, que les ames, qui seront un jour ames humaines, comme celles des autres especes, ont été dans les semences, et dans les ancêtres jusqu'à Adam, et ont existé par consequent depuis le commencement des choses, toûjours dans une maniere de corps organisé, en quoi il semble que Monsieur Swammerdam, Le R. P. Mallebranche, M. Bayle, M. Pitcarne, M. Hartsoeker, et quantité d'autres personnes très-habiles soient de mon sentiment. Et cette doctrine est assez confirmée par les observations microscopiques de M. Leeuwenhoek, et d'autres bons observateurs." *Theodicée*, p. 134.

[y] See note, p. 155.

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[z] The idea of rest is not necessarily implied in the Hebrew word שבת, or in its Greek translation κατέπαυσεν.

[a] Is. xl. 28.

From such processes of reasoning it has been concluded, that there are to be no future creations; that all the generations of plants and animals which are yet to appear, have been existing some where or other for thousands of years ; and that embryo animals, so long invisible, make their first appearance in the sperm of the male, as seminal animalcula, or under the appellation of germs, if they appear in the ovaries of a female. What they have been doing, where they have been stationed, or where they have been wandering since the creation, are questions not very easily answered upon any hypothesis that has yet been devised.

SECTION VI.

THE HYPOTHESES OF INVOLUTION AND DISSEMINATION.

In maintaining this invisible pre-existence, some have imagined that the numerous generations of each species were, as soon as created, packed up together, either side by side, or one within the other, like concentric strata in a bulbous root, in a parcel so small as not to be visible, and then deposited in the ovaries or testicles of their first parents, to be successively and gradually evolved by the future processes of generation. This is the theory of involution.

But how the same parcel came to be placed in two ovaries, in two testicles, or in all the four at the same time; or how it was preserved, when these ovaries and testicles were dissolved by death, are problems which still remain to be solved. Haller and his followers were of opinion, that the package was lodged in the two ovaries; and some of them accordingly found a fœtus that had been formed in the ovary of an infant female; while those ambitious of an equal honour for the testicle of the male, discovered, on one fortunate occasion, a fœtus that had grown in the testicle of a monk [b].

The less ingenious and the more inexpert, who could not comprehend this intricate mode of packing and unpacking, which was puzzling even to Bonnet himself, have generally preferred the mode of disseminating them all at once, scattering them abroad as soon as created, through the regions of space, to people the air, the waters, and the earth, and there to wait for proper opportunities of insinuating themselves into ovaries and testicles, that may be unoccupied [c], and neither too old, nor yet too diseased for developing their contents. This is the theory of dissemination.

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[b] See Blumenbach on Generation, translated by A. Crichton, p. 47. London, 1792, 8vo.

[c] See above, p. 19, note v.

How the germs, in expectation of these habitations, are able to distinguish their own species; how they obtain information of the ovaries or testicles which are suited to their purpose, and ready to receive them; how, after this information is obtained, they discover the way by which they are to enter, whether by the breath, along with the food, or by the absorbents opening on the surface; whether, after the select few are developed which the usual wants of the species require, or after the ovary and testicle are incapable of developing more, myriads that remain in their primary state immediately retire in search of other testicles and ovaries, or remain till the spirit of the body, in which they reside, be summoned to a tenement beyond the grave; are other queries which are still unanswered.

The amiable Bonnet, a zealous supporter of both these hypotheses, though inclined to prefer that of involution[d], makes no attempt to unveil the mysteries with which they are surrounded, till he comes to the period of generation; and then he informs us, that what is commonly called generation is properly no generation at all, but merely a process of development, or expansion. This brings him again into a series of new difficulties, not easily surmounted. Even in his own view of the subject, these difficulties appear of such importance, that he has written a book to explain them[e]; particularly how his germs, during their expansion, may be occasionally turned into monsters; how, by the intercourse of two individuals of a different sex and a different species, they may sometimes be converted into mules or hybrids; and how, after continuing without any change to exist in an almost infinite variety of circumstances for thousands of years, they may at last, in their temporary passage through a testicle or ovary, contract the diseases, habits, dispositions, structure, and form of the parent or parents to whom the testicle or ovary belonged.

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[d] "Je n'ai pas décidé entre l'hypothese de *l'emboîtement* et celle *de la dissemination* des germes, j'ai seulement donné entendre que j'inclinois vers l'emboîtement," &c. *Contemplations de la Nature*, p. xxv.

SECTION VII.

OPINIONS OF PRIESTLEY.

PRIESTLEY, who adopts the hypothesis of germs, has blended it with opinions[f] which, in some measure, are peculiar to himself. Supported by several fathers of the church, and by the the general notions of the vulgar, he believes that a spirit is nothing more than a subtile or refined material body, and remarks, that the words in several languages employed to signify the air, the breath, an attenuated vapour, or a volatile fluid, are also employed to express the cause of the vital phenomena. The vulgar indeed and the fathers of the church, extended their creed considerably farther, and believed that the spiritual body, which was the cause of the vital phenomena, was, in point of existence, totally independent of the grosser body, which is liable to death; and that, when the grosser body was dissolved, and returned to its dust, the spiritual body might remain behind, and, as freed from a prison, might float through the air in the character of a ghost or an apparition. Nay, many imagined that the bodily form of the apparition was not properly the spirit itself, but only the vehicle in which it was contained. Here Priestley, however, who regarded the fathers of the church and the vulgar only so far as they favoured his sentiments, no longer regards the one or the other, but treats this remaining part of their creed not only with indifference, but with scorn and derision[g]; denies the existence of ghosts and apparitions; calls them the creatures of imagination; says they contribute to remove no difficulty, to explain no phenomenon, and that the vulgar are unworthy of attention, when they ascribe to attenuated matter any other properties than those which belong to matter in general[h]. Among these properties Priestley can see nothing like *impenetrability*, but every where *extension*, *repulsion*, and *attraction;* properties which he finds are not accidental, but absolutely essential to its nature and being, and without which it would come at last to be nothing at all[i].

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[e] See his work on organised bodies.

[f] These he enumerates in sect. xx. part ii. of the first volume of his *Disquisitions relating to Matter and Spirit.* Birmingham, 1782, 2 vols. 8vo.

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[g] Vol. i. p. 103.

[h] "To the vulgar, indeed, the *attenuation* of matter may make

Sensation and thought, though neither the properties, nor any of the necessary effects of matter, may notwithstanding be the consequences of mechanism, as the mechanism, for instance, of the nerves or the brain[k]; there being, he thinks, "the same reason to conclude that the powers of sensation and thought are the necessary result of a particular organization as that sound is the necessary result of a particular concussion of the air." "To adopt an opinion contrary to this is to form an hypothesis without a single fact to support it[l]; and,

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it seem to approach to the nature of *spirit;* but the philosopher knows that in fact no attenuation of matter brings it at all nearer to the nature of a substance that has no common property with matter." Vol. i. p. 104.

[i] "All the properties that have hitherto been attributed to matter, may be comprised under those of *attraction* and *repulsion* (all the effects of which have been shewn to be produced by *powers*, independent of all *solidity*) and of *extension*, by means of which matter occupies a certain portion of space." Vol. i. p. 45. "This foreign property, as it has been called, [attraction] is in reality absolutely essential to its very *nature* and *being*. For when we suppose bodies to be divested of it, they come to be *nothing at all*." P. 11.

[k] "Mechanism is the undoubted consequence of materialism." Vol. i. p. v.

[l] Ibid. p. 48.

therefore, he maintains that "to say that reasons and ideas are not things material, or the affections of a material substance, is to take for granted the very thing to be proved [m]." Of this last assertion we willingly and readily admit the truth. But is not the doctor here assuming to himself a privilege which he refuses to others? On what evidence does he presume to assert that the organism of the brain is that which produces thought and sensation? Those anatomists who have frequently seen it, and frequently examined it with the utmost attention, have never observed it produce such effects. They have often, it is true, proceeded upon the hypothesis that it did so; but that hypothesis has not been confirmed by any investigations which they have made: the brains which they have seen and examined, are acknowledged by all to have been organisms which had been formed out of the blood once flowing in the vertebral and encephalic arteries; organisms preceded by the vital phenomena; which had formed that blood; which had caused its circulation; which had converted its fluids into solids, and given to those solids a regular and systematic arrangement; and, consequently, organisms which had been the effects rather than the causes of vital phenomena. Besides, it is known that organic affections are rather the consequences than the causes of disease, although it is granted that they afterwards co-operate with the causes which produced them in extending its influ-

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Ibid. p. 115.

ence. In examining bodies therefore after death, nothing is more common than to find the whole structure entire, and yet not a single function remaining. Thus anatomy assures us, and assures us daily, that no error, general as it may be, is more palpably gross than that which leads the vulgar to suppose that some visible change in the organism must always necessarily precede death. Such a change sooner or later invariably follows, but in thousands of instances no such change has been found to precede; for had it preceded, it would have remained, and then been discovered upon accurate inspection.

Partial however as Priestley is to matter, he does not pretend that by its extensions, repulsions, or attractions, it can produce such an organism as the brain. He readily admits that all organisms which either exhibit, or have once exhibited, the phenomena of life, must have owed their existence to design and intelligence, and not to an ordinary design and intelligence, but to those of the great sovereign of nature, who created them at once in the form of germs. This was the opinion, he says, of Dr. Watts, and of that excellent philosopher Bonnet; an opinion, he adds, which no man can say is unphilosophical[n].

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[n] Priestley, like Bonnet, inclines to the theory of involution rather than to that of dissemination, and, upon the evidence of Bonnet's experiments, is disposed to believe, "that all the germs of future plants, organical bodies of all kinds, and the reproducible parts of them, were really contained in the first germ." His reply to those who may chance to entertain a contrary opi-

His proofs that these organisms must be the causes of the vital phenomena, are the same which have been so often repeated and so often exploded since the days of Lucretius. He observes, that all the vital phenomena not only appear and disappear with the visible structure, but appear and disappear just in proportion as the structure is approaching to vigour or decay. Let us for the sake of argument suppose that this statement is not only correct, but is a demonstration that the vital phenomena must depend upon the organism for their existence; by parity of reasoning, we may also demonstrate that the genius of an artist depends both for its vigour and existence on the nature of his tools. If the vital phenomena cannot be displayed but through the medium of a visible structure, so neither can the genius of the artist but through the medium of those tools which are absolutely essential to the execution of his designs. If the vital phenomena appear and disappear just in proportion to that state of the organs which is essential to their existence, so will also the displays of the artist just in proportion to that state of his tools which is found necessary to the exercise of his art. If the vital phenomena entirely disappear when the structure has become the wreck of disease, so will the displays of the artist

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nion, is somewhat characteristic of his manner. "Those who laugh at the mere mention of such a thing, have certainly a small share of *natural science,* which indeed generally accompanies conceit and dogmatism." Vol. i. p. 201.

cease when his tools are rendered useless. If the vital phenomena sometimes disappear when no anatomist can discover the causes of death in the structure, so will the artist sometimes disappear when no external appearance of his tools, and no chemical or mechanical analysis of their materials can account for his absence. On the other hand, as tools imply the previous existence of life and design in the artist that formed them, so all the organisms to be found in the animal and vegetable kingdom as necessarily imply the previous existence of vital phenomena; and therefore we never observe a specimen of a plant or animal, although it has been dead for thousands of years, but we also suppose that it must once have lived. And thus organization, even with materialists when they have not their hypothesis immediately in view, is avowedly rather the effect than the cause of what are termed vital phenomena.

That the vital phenomena are generally modified by the nature of the structure through which they are displayed, cannot be denied. But, upon the supposition that the structure is the cause of all these phenomena, how can it be explained that they so often employ it as a tool, and frequently as a tool for its own destruction? Priestley, with this fact in his view, and losing sight of his own hypothesis, occasionally speaks of the mind and the body as two distinct species of beings, and governed by quite different laws; "the one," he says, "being absolutely governed by intellectual laws and influences, and the other by corporeal ones[o]." In one instance, while his thoughts are intent on defending Christianity, and his fancy under the full operation of his hypothesis, it appears to him to be absolutely necessary to abandon the notion of a soul, if we would retain Christianity at all[p]. Instead, therefore, of a body and soul, it is only the original germ of the body, or some stamina of that germ, which are to be summoned to make their appearance at the resurrection; when that germ which had never thought, or reasoned, or felt, or remembered any thing, till it passed through the processes of generation, and acquired by nourishment a large quantity of adventitious matter, is to be loaded with adventitious matter again, and that matter to be organized and endowed with both thought and sensation, that it may be in a state for suffering the punishments and receiving the rewards respectively due to the vices and virtues of its former body. The insensible germ is therefore brought forward seemingly for no other purpose than to identify the two bodies, and to remove any suspicion, that the first body suffers its punishments or receives its rewards only by proxy[q].

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[o] Vol. i. p. 145.

[p] "On the whole, the state of things is now such, that it appears to me to be absolutely necessary to abandon the notion of a *soul,* if we would retain Christianity at all. And, happily, the principles of it are as repugnant to that notion, as those of any modern philosophy." Preface, p. xxx.

[q] See vol. i. p. 142, 194.

According to Priestley, even the Deity himself is material; though we must not, he says, strain our analogy so far as to suppose his materiality similar to that of the human nature. The only property, however, which he seems to be confident is common to divine uncreated nature, and to matter in general, is the property of extension; for the Deity, he thinks, in order to act every where, must also be every where[r]. His ubiquity or omnipresence necessarily implies a real extension[s], it being impossible, as he imagines, that a substance which has no relation to space can exist at all[t], as it could

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[r] "The divine being, in order to his acting every where, must be every where." Vol. i. p. 142.

[s] "It has been said, that, notwithstanding I decline the term, I virtually make the Deity to be a material being. But, it will be found by the candid and attentive, that I have not in reality any idea of the divine essence that is at all different from that of those philosophers and divines who maintain the *proper omnipresence* or *ubiquity* of the divine being, which necessarily implies a real extension, and that he has a power of acting upon matter." P. 148.

[t] "But if, with modern metaphysicians, we intend to denote by it (*i. e.* the term immaterial) a substance that has no property whatever in common with matter, and that even bears no relation to space, I must deny that any such substance exists; because, according to such a definition, the divine being is necessarily cut off from all communication with, and all action or influence upon, his own creation." P. 143.

"The system of materialism has unquestionably this advantage, that it is entirely free from another difficulty, viz. *how an immaterial substance can act upon matter;* a difficulty which, in my idea, amounts to an absolute impossibility, as those substances have hitherto been defined." P. 146.

The idea of Boscovich and Michell, "is much more not be said to exist any where. Whether the moral and intellectual attributes of deity be necessarily connected with such an extension, and the result of material mechanism, as the moral and intellectual faculties of man are supposed to be, he has not informed us. If viewed however as resulting from mechanism, it must be a mechanism formed without design and intelligence. Or, if viewed as not resulting from mechanism, the inference is implied, that moral and intellectual powers of infinite perfection have not only existed, but existed from eternity independent of mechanism.

Though the nature of spirit, a species of mind, or a species of substance of whose operations we are daily conscious, be, according to Leibnitz, more comprehensible than that of matter, yet, from its being invisible, there are many who suppose its existence doubtful, while in talking of matter, they always imagine that they are talking of something which is known, or of something which is an object of the senses. Thus Priestley, in alluding to the essence of the Deity, observes, that it "cannot be the object of any of our senses, as every thing we call matter is[u]." Now, what are these *every things*

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consonant to the idea which the sacred writers give us of the omnipresence of the divine being, and of his *filling all in all*, than that of a being who bears no relation to space, and therefore cannot properly be said to exist any where, which is the doctrine of the rigid immaterialists." P. 147.

[u] Priestley, vol. i. p. 142.—"Nihil est difficilius, quam a consuetudine oculorum aciem mentis abducere. Ea difficultas in-

which are objects of the senses, and which we call matter? By his own acknowledgment, not any of the simple elements of matter; not any of its atoms; not any of its monads; not any of its primary organic germs; not even its solidity or impenetrability, if we credit Priestley; and not one particle, or one aggregate of what is supposed to be uncreated matter; for, on his hypothesis, there seems to be a matter of this kind, as he frequently talks by way of distinction of created matter. Nay, what information do the senses afford us of created matter, if according to him, to Boscovich and Michell, all the solid matter in the solar system may be contained within a nut-shell[y]? Only compress it into that bulk, and our senses, in measuring the stomach of a squirrel, will assure us, that a squirrel may, upon this hypothesis, swallow near a dozen of solar systems, with all their oceans, continents, and islands, and with all their immense leviathans and behemoths at a single meal; and, if as digestible as common nut-kernels, will a few hours after hunger and thirst for a dozen more.

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duxit et vulgo imperitos, et similes philosophos imperitorum, ut, nisi figuris hominum constitutis, nihil possent de diis immortalibus cogitare, cujus opinionis levitas confutata a Cotta non desiderat orationem meam." *Cicero de Nat. Deor.* lib. ii. § 17. See above, note n, p. 18.

[y] "It has been asserted, and the assertion has never been disproved, that for any thing we know to the contrary, all the solid matter in the solar system might be contained within a nutshell, there is so great a proportion of void space within the substance of the most solid bodies." Vol. i. p. 22.

From the idea that a quantity of matter of the bulk of a nut-kernel may compose the whole of the solar system, he is led to infer that its particles act where they are not, and if he had followed up his hypothesis, might have asserted that they also must act at the distance of many millions of miles; their extension only, and not their powers of repulsion and attraction, having some definite relation to space. On the other hand, as he does not admit the existence of any thing that is not matter, and as he admits nothing to be matter, if we except the divine nature, that is not also an object of sense, the spaces interposed between its particles, be they fractions of inches, or millions of miles, must be mere vacuums; vacuums which cannot be easily reconciled with that ubiquity, and that extension which he assigns to the divine nature.

It seems to have been a species of axiom with the Epicureans in the days of Lucretius, that supposing substances to be purely incorporeal, they could not possibly act upon substances of a different nature, or on those which are corporeal [z]. On what principles such an axiom was founded, whether directly on the evidence of sense, or on that and the abstract processes of reason, I have never yet been able to discover. The idea, however, is prevalent, and has led to many a singular conclusion and extravagant hypothesis. Many who adopt it believe that the Deity is purely in-

See above, p. 65.

corporeal, and yet acknowledge his unlimited influence over what is called matter. Priestley here being much more consistent, has added to the other attributes of Deity one of the common properties of matter, that of extension, and to this extension has given a local presence and ubiquity; as, in his opinion, the Deity, in order to act every where, must also be every where present. But, in thus restricting the influence of the Deity to the place which he occupies by his extension, he forgets that he sinks him below the level of created matter, which, beside extension, possesses in an eminent degree the powers of repulsion and attraction, and therefore is allowed to operate at a distance, or where it is not; a privilege which he refuses to the Deity.

The genius of Priestley, his ardour, his energy, his acuteness, and his readiness of apprehension, are by no means equalled by his coolness of reflection, or his strength of judgment. He seems better qualified to plead a cause, than to decide on its merits, is more expert at collecting arguments, than at seeing their bearings, or weighing their consequences. Deeply impressed with the feelings of the moment, he too often draws his conclusions from the first impressions; and, afterwards, as his knowledge extends, is either obliged to change his opinions, or to invent some ingenious sophism to reconcile them. Guided by temper more than by prudence, he speaks as if he were dragged into controversy, while to others he appears as if anxiously courting it. From ardour and impatience, he is eager and confident, where those of cooler reflection would hesitate. By freely uttering all that he thinks, he imagines he is only proving his sincerity. By contriving sophisms that deceive only himself, he thinks he is confuting or convincing others. In considering opinions, laws, and establishments, which are not to his liking, he labours as if under a sense of oppression; and yet, while an advocate for civil liberty and freedom of discussion, he maintains, at the same time, that the will is absolutely governed by necessity. In changing his opinions, and adopting the contrary, he believes that this fickleness is owing to his candour, while others will certainly be more inclined to trace it to his temper, which varies with every trifling circumstance, and appears as unstable as the form of a cloud[*].

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[*] The reader who is acquainted with the theological and metaphysical writings of Priestley, will probably recognise many of the features which distinguished his mind, on comparing his character with that of Montaigne, as drawn by the celebrated Professor Stewart; or with that of a sceptic in religion, as pourtrayed by Bishop Earle. "Montaigne," says the philosopher, "never thinks of forming a sect, but, yielding passively to the current of his reflections and feelings, argues, at different times, according to the varying state of his impressions and temper, on opposite sides of the same question. On all occasions, he preserves an air of the most perfect sincerity; and it was to *this*, I presume, much more than to the superiority of his reasoning, that Montesquieu alluded, when he said, 'In the greater part of authors I see the *writer*, in Montaigne I see nothing but the *thinker*.' The radical fault of his understanding consisted in an incapacity of forming, on disputable points, those decided and fixed

SECTION VIII.

OPINIONS OF HALLER.

Haller was long inclined to the hypothesis of the *epigenesists*, or of those who imagine that the structure of the offspring is formed by some generative processes in the bodies of the parents; but upon observing, in an incubated egg, that the vessels of the fœtus were extended to the membrane enveloping the yolk, and reflecting that the yolk, enveloped in its membrane, is known to exist prior

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opinions which can alone impart either force or consistency to intellectual character." "A sceptic in religion," says the bishop, "is one that hangs on the balance with all sorts of opinions, whereof not one but stirs him, and none sways him; a man guiltier of credulity than he is taken to be; for it is out of his belief of every thing that he believes nothing. Each religion scares him from its contrary, none persuades him to itself. He would be wholly a Christian, but that he is something of an atheist; and wholly an atheist, but that he is partly a Christian; and a perfect heretic, but that there are so many to distract him. He finds *reason* in all opinions, *truth* in none; indeed the least reason perplexes him, and the best will not satisfy him. He finds doubts and scruples better than resolves them, and *is always too hard for himself.*" "If this portrait (adds Mr. Stewart) had been presented to Montaigne, I have little doubt that he would have had the candour to acknowledge, that he recognized in it some of the more prominent and characteristic features of his own mind." *Dissertation on the Progress of Metaphysical, Ethical, and Political Philosophy*, p. 77.

to impregnation, he began to think that the fœtus might also have had a previous existence. In pursuing this new train of ideas, he became more confident in his opinions, and at last declared, that his experiments and the force of truth imperiously compelled him to adopt the hypothesis of the evolutionists[b], or of those who imagine that the structure of the offspring is not organized in the body of the parent, but as pre-existing and already organized, is merely developed by the generative processes. This change in his sentiments appears to have occurred in 1758, in the course of which year, as Blumenbach[c] informs us, he read his celebrated paper on the subject to the Royal Academy of Sciences at Göttingen, of which he at that time happened to be president. The celebrity of his name soon made this change in his sentiments to be generally known; and it was particularly welcome to Bonnet, who previously became partial to the hypothesis of evolution, and who spoke of the observations of Haller as containing a new and important discovery so much in its favour, that it almost amounted to a demonstration. Nor was it less welcome to the friend and correspondent of Bonnet, Spallanzani, the professor of natural history at Pavia, who, long conversant in the use of the microscope, talks of no fewer than four generations in the bulb of a hyacinth, and thirteen in the body of a volvox [d].

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[b] "Satis apparet ex scriptis meis, ad theoriam *epigeneseos* animum mihi inclinatum fuisse, quæ mihi cum phenomenis rectius videbatur consentire. Adeo vero hæc difficilia sunt, adeo varia sunt in utramque partem argumenta, ut veniam omnino sperem, si ad oppositam *evolutionis* sententiam transiero. Ita experimenta me cogunt et imperiosa veritas. Primum quidem, tot nunc edoctus incisionibus, didici ea ipsa exempla, quæ credebam refutare evolutionem, confirmare quam maxime." Halleri *Opera Minora*, vol. ii. p. 406 Lausannæ, 1767, 3 vol. 4to.

[c] Blumenbach on Generation, p. 31.

SECTION IX.

NEW DIFFICULTIES TO BE SURMOUNTED—MANY SPECIES OF ANIMALS MAKE THEIR APPEARANCE WITHOUT THE PROCESSES OF GENERATION.

Animalcula infusoria spring up suddenly in both animal and vegetable infusions, or, according to Fray, in mineral mixtures, not through a regular and continued series of generations, but without parents, as if by a new and original creation. Spallanzani and Bonnet, who not only remarked, but also contributed to establish the fact, had here to renounce their favourite hypothesis of involution, to adopt that of dissemination, and to admit that the process of developement by generation was not universal. Still, however, they adhered to the hypothesis, that plants and animals had all been existing since the creation, and that these animalcules, though utterly invisible, had from time immemorial been existing in the air, the water or the earth, waiting opportunities for their own peculiar modes of developement; but, as none was supposed to have had its residence in the element of fire, that element was employed as a test to ascertain in which of the three remaining elements they principally resided. For this purpose, the animal and vegetable matters of the infusions were boiled[e], roasted[f], subjected even to the heat of a blow-pipe[g], and immediately shut up, not only in vessels accurately corked, but hermetically sealed. Animalcules notwithstanding sprung up in numbers when the vessels were capacious[h]. It was then supposed that the germs might have been existing in the water, which had been inclosed along with the animal and vegetable matters: upon this the water was previously distilled, and afterwards examined minutely through the microscope before it was inclosed[i]; an examination evidently superfluous, as, by the hypothesis, germs are not visible until they are partly at least evolved. The suspicion next fell upon the air, and more particularly as a smaller number, and in less variety, appeared in vessels of narrower dimensions where the air was scanty[k], and they never made their appearance at all when the infusions were confined *in vacuo*. But the air was also exposed to boiling heat after it was inclosed. From whence then came the animalcules? If their germs were existing amidst the particles of the infusions, or the particles of air, they must have remained uninjured in temperatures which, with an anomalous exception or two[l], had been found sufficient, when the heat was communicated through the medium of water[m], to destroy vital processes in every other species of organized beings; for it had been found, that no seeds which had been in water at the temperature of 212° afterwards germinated [n]. But the germs of seeds might resist higher temperatures than the seeds themselves, as seeds and eggs were found to resist much higher temperatures than the plants and animals into which they were expanded. If the germs, however, contained in the vessels, were not able to resist the degrees of temperature to which they were exposed, the germs from which the animalcules sprung must have come from without, and must have penetrated like the particles of light through the substance of the vessels, if they were transparent; or, like the particles of caloric, the electric, magnetic, or galvanic fluids, if the vessels were opaque; or they must have been formed by the operation of inherent powers belonging to the particles within the vessels, or by the operation of some agent who is every where present, and whose presence cannot be prevented, power resisted, or plans obstructed by either the density or opacity of vessels. Amidst these hypotheses, it is

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[d] "One egg has oftener than once been found within another, and some osseous parts of one fœtus included in another fœtus. The butterfly is first included in the shell of the chrysalis, and the chrysalis in the skin of the caterpillar. In vegetable seeds are found the rudiments of the future plant, and the fourth generation has been seen in a hyacinth root. The volvox affords a new and beautiful instance of envelopement; the eye has been able to see the thirteenth generation: probably that is not the last." *Tracts on the Natural History of Animals and Vegetables*, translated from the original Italian of Spallanzani, by John Graham Dalyell, Esq. Advocate, vol. i. p. 142. edit. Edinb. 1803, 2 vols. 8vo.

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[e] Spallanzani's Tracts, vol. i. p. 9.

[f] Ibid. p. 11. [g] Ibid. p. 12. [h] Ibid. p. 15, &c.

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[i] Ibid. p. 6.

[k] Ibid. p. 15, &c.

[l] A worm is, in the next note, said to have been found alive in the body of a fish supposed to have been boiled in the very part where the worm had its residence.

[m] The learned translator of Spallanzani has the following note on the temperatures of the air to which animals may be exposed for certain periods without much danger. "In a memoir on this subject, it is said that a girl supported 284° in an oven without inconvenience. Those serving the oven bore 257° a quarter of an hour, and perhaps could have endured 212° half an hour. Tillet *sur les chaleurs auquels les hommes sont capables de resister.* Mem. de l'Acad. Roy. 1764. Several

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persons bore a room heated to 198°, 210°, 211°. The same persons could just bear cooling spirits at 130°, cooling oil at 129°, and cooling quicksilver at 117°. They could not suffer the heat of water at 125°. *Phil. Trans.* 1755, p. 117, 120. Different persons at Liverpool bore the heat of an apartment at 224°; and Sir Charles Blagden bore one at 260°. *Phil. Trans.*

"A dog has been in the heat of 236° without inconvenience; and a species of tænia has been found alive in a boiled carp.

"In Russia, the vapour-bath is said by Storck to be generally 133°; according to D'Auteroche, 167°: and Acerbi observes, that those in Finland are from 158° to 167°." Spallanzani's *Tracts*, vol. i. p. 33.

[n] Ibid. p. 39.

natural to suppose that each philosopher would prefer the one which was most congenial to his previous habits and modes of thinking. Spallanzani therefore preferred the hypothesis which favoured the pre-existence of germs, imagining that the temperatures to which he exposed the animal and vegetable matters, must have destroyed the vegetative powers of any particles of which they were composed[o]; not reflecting, at the time, that the like temperatures should have also destroyed the vegetative powers of any of his germs. Needham, on the contrary, who was engaged in similar experiments, and was personally acquainted with Spallanzani, was rather inclined to ascribe the origin of these animalcules to certain properties in the particles of matter, but without pretending that these properties were either essential or underived, as obviously appears to have been the opinion of his friend Buffon.

SECTION IX.

OPINIONS OF BUFFON.

THE illustrious Buffon, who rejects the pre-existence of germs, and ridicules the idea of their involution, believes notwithstanding, that plants and animals are composed of germs of another description; and that these germs, in favourable circumstances, may, as embryos of the species, grow to the size of the plant or animal of which they are the component parts. This is the idea which he seems to entertain in commencing his chapter upon Reproduction[p]. "This apparatus," he observes, "appears, at first sight, to suppose a profusion of expense. Such magnificence, however, is not uncommon in nature. It is discernible even in the more common and inferior species, as in worms, polypi, elms, willows, and many other plants and insects, every part of which contains a whole[q], and, in order to become a plant or an insect, requires only to be unfolded or expanded. Considering organized bodies under this point of view, an individual is a whole uniformly constructed in all parts, a collection of an infinite number of particles every way similar, an assemblage of germs or minute individuals of the same species, which, in certain circumstances, are capable of being expanded, and of becoming new beings like those from which they were originally separated."

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[o] Spallanzani's *Tracts*, vol. i. p. 13.

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[p] The passages which I quote from Buffon, or to which I refer, will be found in the second volume of an accurate translation of his History of Quadrupeds, which was published at Edinburgh in 1780, in eight volumes 8vo. The translator was Mr. Smellie, himself a learned and ingenious naturalist, who, in his dedication to the author, says, "The task, it must be acknowledged, was arduous, but your approbation and encouragement, by redoubling my vigour, diminished the difficulty of the labour."

[q] In the copy of Smellie's translation which belonged to the late Dr. Walker, Professor of Natural History in the University of Edinburgh, I find the following marginal annotation; "This seems to be the foundation of his theory, but it happens to be an error. No part of an elm or a willow contains a whole, except the seeds of buds, and the number of these, it is well known, is not infinite."

"This idea, when traced to the bottom, discovers a relation between animals, vegetables, and minerals, which we would not have suspected. Salts, and some other minerals, consist of parts similar to one another, and to the whole[1]." To this hypothesis, for which he is partly indebted to Leeuwenhoek, Leibnitz, and Bonnet, he occasionally returns, and occasionally adheres, but appears incapable of adhering steadily to any hypothesis: his practice seems to be, to glance at a subject, to examine it partially, and then to form an opinion of the whole; to glance again, take a different view, and again to form a different hypothesis; and thus he proceeds detailing a series of various opinions, which, though obviously inconsistent, he never even once attempts to reconcile.

Thus reflecting upon the numerous experiments which he had made with Daubenton and Needham, he begins to suspect that there was some fallacy in his previous conclusions; and that the moving particles which they had seen in the seminal fluids, and in a variety of both animal and vegetable infusions, were not decidedly embryos or germs; for though most abundant in the semen of animals and the seeds of plants, they were also found in varieties of substances which had been exposed to a roasting heat: and what further convinced him that they were not animals was, that they moved only for a time in a certain direction; moved without intervals; and when once stationary, moved not again; and never were observed to propagate their species. That such moving particles, even supposing them to have been germs, should propagate their species, was not to be expected; yet as they did it not, and besides, were deficient in some other characters which he thought requisite to constitute germs, he concludes that they were not germs, but a kind of living and organic particles, equally adapted to the formation of every species of organized structures, whether plants or animals; all of them precisely of the same species, not the result of any process of generation, not the effect of any animal or vegetable process, but substances constituting the universal semen, and rather the causes than any of the consequences of organization[g]. In one passage he says, that he

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[1] Vol. ii. p. 17.

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[g] "They are not the produce of generation. They have no uniformity of species. They cannot, therefore, be either animals or vegetables. They are to be met with in every part of animals and of vegetables." Vol. ii. p. 222.

"They are not animals, but organic moving particles, contained *originally* in the food, and found in vast numbers in the seminal liquors of animals, which are the most pure and most organic extracts derived from the food." P. 235.

"There exists, therefore, in vegetables and animals, a living substance which is common to them both; and this substance is the matter necessary to their nutrition. *The animal is nourished by vegetable or animal substances; and the vegetable is nourished by the same substances in a decomposed state.* This common nutritive substance is always alive and active. It pro-has demonstrated their existence, but a few pages after informs us, that he only intends to demonstrate it [t]. He indeed imagined, while he was reasoning from another hypothesis, that he had actually proved that there is an infinite number of germs existing in nature; but here he forgets

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duces an animal or a vegetable, whenever it finds an internal mould or matrix accommodated to the one or the other." P. 252.

"These living organic particles being common to all animated beings, they are capable of forming particular species of animals or of vegetables, according to the particular arrangement they assume. Now, this arrangement depends entirely on the form of the individuals which furnish the organic particles." P. 252.

"When this organic matter, which may be considered as an universal semen, is assembled in great quantities, as in the seminal fluids, and in the mucilaginous part of the infusions of plants, its first effect is to vegetate, or rather to procure vegetating beings." P. 253.

"Almost all microscopic animals are of the same nature with the moving bodies in the seminal fluids, and in infusions of animal and vegetable substances." P. 254.

It is "extremely probable, that there really exists in nature an infinite number of small organized beings, every way similar to those large organized bodies which make such a conspicuous figure in this world; that these small organized beings are composed of living organic particles, which are common both to animals and vegetables, *and are their primary incorruptible elements;* that an assemblage of these particles constitutes an animal or a plant; and, consequently, that reproduction or generation is nothing but a change of form, effected solely by the addition of similar particles; and the death, or resolution of organized bodies, is only a separation of the same particles." P. 22, 23.

[t] "The existence of infinite numbers of organic particles which constitute life have been already demonstrated." P. 37.

"We shall demonstrate that there are in nature infinite numbers of living organic particles." P. 41.

that he is reasoning from a different hypothesis, that it is not germs which exist in nature in such infinite numbers, but certain living and organic particles of which germs are composed, and which are their *primary incorruptible elements.* The germs, as appears from the extracts subjoined, are formed of those elementary particles, by certain processes in the living bodies of plants and animals; and, accordingly, are representations in miature of those species of plants and animals in whose bodies they are organized. The particles, on the contrary, are all of the same species, common to every organized body, and the primary and constituent principles of its food. It is true, however, that Buffon, notwithstanding this marked and obvious distinction which he draws between them, does frequently afterwards, from motives best known to himself, endeavour to confound them, and to represent particles as germs, and germs as particles, whenever he thinks that his argument requires it. But as the hypothesis of germs is not his, and as he contrives another in its stead, to account even for the formation of germs, we shall take it for granted that his living organic particles exist, and shall only inquire how by these particles he means to explain the phenomena of life and organization.

If plants and animals are constructed on plans determinate and specific, what forms these plans, and what directs the *motus politicus* in the execution? Do these organic particles assemble in council, concerning the size and form of the fabrics which are to be constructed; do they think of the way in which they are to build them; of the quantity of labour which may be required; of the time necessary for completing them; or of the probable extent of their duration? No, these particles trouble not themselves with any such matters, they expend not a thought on what they have done, on what they are doing, or on what they are to do. In the construction of a plant or animal, they merely take a shape from certain moulds in which they are cast. These moulds are external and internal; the former regulate the external appearance, and the latter regulate the internal structure. That there should be moulds allotted to these purposes, Buffon thinks it expedient and necessary, and therefore takes the liberty of supposing that such moulds actually exist. Not moulds, however, like the ιδεαι of Plato, exemplars or prototypes in the mind of the Deity, of every form and of every structure that exists in the universe. In his first thoughts, the moulds of Buffon are nothing more than the plants or animals into which his organic particles are thrown. "An animal body," he informs us, "is a kind of internal mould, in which the nutritive matter is so assimilated to the whole, that, without changing the order or proportion of the parts, each part receives an augmentation[u]." "But how," he says, "can we have a clear idea of this augmentation or expansion, if we consider not the bodies of animals, and each of their parts, as so many internal moulds which receive the accessory matter in the order that results from their position and structure [v]?"

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[u] Ibid. p. 39.

From this explanation, it evidently appears, that it is not the living and organic particles which organize animals and plants, but, on the contrary, it is animals and plants which organize the living and organic particles. These questions therefore remain unanswered: What organizes animals and plants? Who invented such moulds? and, How came such moulds to propagate their species? In reply to these queries, our author observes that "the matter assimilated by an animal or vegetable, is an organic matter of the same nature with that of the animal or vegetable; and, consequently, may augment the size without changing the figure or the qualities of the original moulds; because it has the same qualities and the same form with the matter of which the moulds themselves are composed [w]." And therefore, "in an organized and expanded body, nothing farther is necessary for the reproduction of a new body similar to itself, than that it should contain some particle every way similar to the whole. This particle, at its first separation, will not present to our eyes a sensible figure by which we can compare it with the whole body. But, when separated from the body, and put in a situation to receive proper nourishment, this similar particle will begin to expand and to exhibit the

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[y] Ibid. p. 39.

[w] Ibid, p. 41.

form of an entire and independent being, of the same species with that from which it was detached[x]." In this additional view of the subject, all the living and organic particles have appeared to our author to be moulds themselves; and he now returns to a former hypothesis which he had rejected, that the moving particles are actually germs, and not of one species, but diversified according to all the varieties of animals and plants. That he may not however adopt the hypothesis of any other speculatist, without improving it or adding something new, he informs us of the manner in which the little moulds enter the great ones in order to expand them, and he says they do it by penetrating forces. For as mechanical principles alone, he thinks, must be vain and ineffectual in explaining the circulation of the blood, muscular motion, and other functions of an animated body, we ought not to reject penetrating forces, when we have examples of such powers in gravity, magnetic attraction, and chemical affinities[y]. Then let us admit them, and listen to the account which he gives. His account of them is this: "These powers, as formerly observed, are beyond the reach of our senses; because their action is exerted upon the intimate structure of bodies. It is evident, therefore, that we can never obtain a clear idea of them, nor of their mode of acting[z]."

After receiving so little information from this account of the penetrating forces, let us next inquire how the several particles are made to expand either an animal or vegetable mould, and yet so as to maintain the several modifications of form, of structure, and proportions, which it undergoes in its gradual changes from an embryo state to that of maturity. Here, instead of supposing any such changes as those which we observe in the form, structure, and proportions of the mould, Buffon maintains that in these respects it is always the same, and that the particles enter only into parts whose forms exactly correspond to their own[a].

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[x] Ibid. p. 43, 44. [y] Ibid. p. 53. [z] Ibid. p. 42.

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[a] So far are the moulds, into which the living particles enter, from preserving steadily the characters of their species, that, according to another opinion of our author, they change into quite a different class. Thus in alluding to seeds and eggs, he observes, "there are bodies which are neither animals, vegetables, nor minerals; and that every attempt to arrange them under either of these classes must be ineffectual." P. 217. If the particles, therefore, must always be similar either to the bodies, or the parts of the bodies, into which they enter, those which enter into seeds and eggs should be very different from those which enter into plants and animals; while those which enter into plants and animals, or into beings which propagate their species, should form beings of their own kind, and not seeds or eggs,—things which turn out to be neither plants, animals, nor minerals. But if seeds and eggs be so very different from plants and animals, and yet regularly grow into plants and animals; and plants and animals so very different from seeds and eggs, that they belong not to the same class of beings, and yet always produce either seeds or eggs, it should follow, that no organized being, whether seed or egg, animal or plant, was ever yet known to produce another after its kind, and though what it produces may ultimately assume, in the process of time, all the distinctive characters of the species from

He is here still proceeding on his last supposition, that his particles are germs, and that they receive not a form from the structure into which they enter. They are germs however of a different kind, and of a greater variety of species than they were at first: formerly, they only corresponded in number with the different species of plants and animals; now, they are found to correspond in number with all the immense diversities of species observable among animal and vegetable organs. Still it is doubtful, if their infinite numbers be not previously ascertained, how they are to augment the size of the mould without changing the figure or qualities of some of its organs. Buffon considers it extremely probable that "they are distributed, by means of some active power, to the different parts, in a proportion so exact, that neither more nor fewer are applied than answer the purposes of nutrition, and of an equal growth and expansion [b]."

The causes of this exact distribution is no further explained than that the particles unite with parts which are similar to themselves: yet how come the particles to know the parts, or how do they calculate the quantity which is necessary for the particular expansion at the time; for, unless they know accurately the several proportions of every organ belonging to the structure, may they not sometimes increase too much the size of the

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which it sprung, yet it first must be compelled to lay aside the form and structure which it received from the primary mould in which it was cast.

[b] Ibid. p. 42.

organ into which they enter, or by neglecting it, leave it too small to be proportional to the rest? Besides, if neither more nor fewer enter the mould than what are necessary for growth, nutrition, and equal expansion, how comes the species to be propagated? For that purpose, our naturalist observes, the proportions are changed. But, granting the change, what is the cause? What informs the moulds or the particles when the change is requisite? And in what manner do they proceed to accomplish it? To these questions he makes no reply; but taking another view of the subject, finds that the particles are not, as he had at first represented them, always restricted to definite proportions. They often accumulate beyond what is necessary to propagation, to growth, nutrition, and equal expansion; and then, if not discharged by some of the emunctories, collect together in fortuitous assemblages, and form the "tape-worm, the ascarides, the worms sometimes found in the veins, in the sinuses of the brain, and in the liver[c]." Nay, "there are, perhaps," he observes, "as many beings which either live or vegetate, produced by a fortuitous assemblage of organic particles, as by a constant and successive generation[d]."

The particles here again evidently appear in a new character. Without the assistance of foreign moulds, and without acting as moulds themselves, they now assemble by mere chance; and, by mere chance, construct, it is thought, perhaps as many animals and plants as are formed by moulds; nay, construct them with such a remarkable semblance of art, with such regularity in form and structure, and with such uniformity in the characters of species, that the naturalist must certainly find it difficult to distinguish between the phenomena of chance and those of design; or, to adopt his language on the subject, between phenomena which have their origin in the laws of nature, and those which have their origin in the fortuitous assemblages of particles.

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[c] Ibid. p. 253.

[d] Ibid. p. 267.

The next class of our author's hypotheses is concerning reproduction by the intercourse of sexes; and this mode he thinks the most common, notwithstanding the numbers of plants and animals which owe their existence to the fortuitous assemblages of organic particles. With respect, however, to the cause or manner by which the first parents of every species had been constructed, or why some species were divided into sexes and others not, our author acknowledges he is "not in a condition to explain *why* things exist; *why* nature almost *universally* employs sexes for the reproduction of animals, or *why* sexes exist." "We ought, therefore," he says, "to content ourselves with reasoning concerning things as they are. If we attempt to rise higher, we lose ourselves in the regions of fancy, and forget the narrow limits of our knowledge[e]." Such is the usual and favourite cant of those physiologists who, under an affectation of modesty, repeat this stale and vulgar apology for not entering upon trains of reasoning which might lead them to a deity, or to final causes; but we shall soon see how far our author is impressed with this sense of his humility, and how far he remembers the narrowness of his knowledge in his attempts to explain the phenomena of reproduction by the intercourse of sexes. In these attempts, the particles are again deprived of all the characters of germs; they are again divided into an immense variety of species, not in proportion to the different species of plants and animals, but in proportion to all the numerous diversities of organs which these exhibit. Of their primary character, when they happened to be all of the same species, and were equally common to plants and animals, they are not permitted to retain a vestige. They are now divided on the old hypothesis of Anaxagoras into osseous, sanguineous, venous, visceral, carneous, and so on[f]; so that each, if not a mould, is a kind of nucleus, around which other particles may collect when similar to itself. On this hypothesis, he proceeds to explain the mode of reproduction by the sexual intercourse; as the species, he thinks, which are divided into two sexes, must necessarily have male and female particles peculiar to the male or female organs[g], so these particles, from being necessary in preserving the distinction between the sexes, are made to preside over the rest in all the processes of generation; and just according as the one kind or the other predominates, they determine the sex of the future offspring, and become the centre or point of union, around which all the other particles are arranged[h]. Now, the other particles are those derived from various parts; the seminal fluid being an extract from all the different species of organs in the two parents[i]. And that these particles may arrange themselves in all due regularity and order around those which constitute the base, it is provided, that in mixing with the particles of the other sex, they shall associate only with those which have had their residence in a similar organ, and in a similar place of that organ. In this way they are not required to change any

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[e] Ibid. p. 285.

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[f] "Nunc et Anaxagoræ scrutemur ὁμοιομερειαν,
Quam Graii memorant, nec nostra dicere lingua
Concedit nobis patrii sermonis egestas:
Sed tamen ipsam rem facile est exponere verbis,
Principium rerum, quam dicit ὁμοιομερειαν:
Ossa videlicet e pauxillis atque minutis
Ossibus, sic et de pauxillis atque minutis
Visceribus viscus, gigni; sanguenque creari
Sanguinis inter se multis coëuntibus guttis:
Ex auræque putat micis consistere posse
Auram, et de terris terram concrescere parvis;

Ignibus ex igneis, humorem humoribus, esse.
Cætera consimili fingit ratione, putatque."
Lucretius, lib. i. 830.

The poet, in the verses which succeed these, is uncommonly animated in combating this homoiomereia, by a mixture of argument and sarcastic ridicule.

[g] Ibid. p. 241. [h] Ibid. p. 282, 286. [i] Ibid. p. 51.

habits, to form any parts, or perform any functions but such as those to which they had been previously accustomed[k]. This idea of the seminal fluid's proceeding as an extract from all the different parts of the body, is far from being new: it is as ancient as Epicurus, who advanced it in opposition to those who imagined that the seed was something incorporeal[l]. Be that as it may, for the sake of argument we admit the extract, but require something more than assertion to convince us with respect to the manner in which its particles arrange themselves so as to produce a living and specific structure. How, for instance, do the particles proceeding from the corresponding organs of the parents recognize one another amidst the confusion of the seminal mixture; how recognise the particles of the right side from those of the left? We can hardly suppose that they are assisted by their chemical affinities, as no such affinities are observed between them when brought into view; and as chemical affinities are uniformly found, when not under superior control, rather to destroy than to construct, or even to preserve organized bodies. Besides, what becomes of this seminal extract when the organs of any of the parents are defective; when their limbs are amputated; or, when there are no eye-balls in their orbits? Are the organs of their offspring equally imperfect? Surely not, if we can trust to daily experience; but they certainly ought to be, according to this old and vulgar hypothesis. Further, we may also be entitled to ask, what particles of the male or what of the female had ever been the particles of a placenta, a chorion, an amnios, or a liquor amnii? It is in vain for the author to reply, that these are formed of superfluous particles [m]. On his present hypothesis, they must form parts similar to those from which they were derived; or, if he recur to a former hypothesis, they should meet together in fortuitous assemblages, and form tape-worms, ascarides, and other different species of vermes; but on all the hypotheses which he has devised, they are incapable of forming a placenta, or any of the membranes peculiar to the fœtus. We would still further ask, how comes the fœtus which is thus formed, to be afterwards nourished by the original particles of the food; by particles common to animals and plants; by particles equally strangers to the fœtus, and to its organs? How come they to select one organ more than another; or how comes one organ more than another to select them? If the author should reply, that the life of the animal may assist in directing these operations, we again have to ask, what does he mean by the life of an animal? and then he will inform us, that he means nothing more than "the result of all the particular lives of each of those active particles, whose life is primitive, and perhaps indestructible[n]." But will this explanation be held satisfactory? Can such a life have more sense, intelligence, or instinct, than any single life of which it is composed? Add cypher to cypher as long as you please, will they ever be found to amount to a unit; and though things which are infinite may extend far beyond our conceptions, will deafness, though infinite, ever produce any thing like hearing; or blindness, though infinite, any thing like vision? These particles are not to be compared to a multitude of counsellors in which there is safety; safety can be in those cases only where the counsellors bring forward various talents, various facts, and various observations, and afterwards combine the general result into one regular and consistent whole. The case is different where a finite or an infinite number of organic particles collect together, either in moulds or fortuitous assemblages; all of them alike, or if not alike, yet none of them capable of communicating to another a single idea, a single energy, or a single property which it had not before. The same note of music repeated in succession, or repeated by myriads of voices at once, will never produce any thing like harmony.

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[k] Thus, organic particles detached from the head will arrange themselves in a similar order in the head of the fœtus; those from the right side passing to the right, and those from the left side passing to the left. Particles from the other parts of the body, where the parts are alike, will arrange themselves upon similar principles. And yet, on this hypothesis, how are the particles from the right and the left of the genital organs, which are so dissimilar in the two sexes, to discover their correlatives in this seminal extract?

[l] Το, τε σπερμα αφ᾽ ὁλων των σωματων φερεσθαι: ὁ γε δει προσκατανοειν ὁτι ουκ ασωματον. Diogenes Laertius; p. 630.

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[m] Buffon, vol. ii. p. 279, 280.

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[n] Ibid. p. 281.

The speculatist, therefore, however acute and ingenious he may be, must always be reduced to his last expedient, before he can think of having recourse to that desperately forlorn hope, that numbers and magnitudes, infinitely great or infinitely small, can create any new species of powers different from those which they had when finite. And yet such a hope appears to have induced many to ascribe to a number of separate atoms of the same kind, when infinitely numerous, or infinitely minute, and beyond their conceptions, an astonishing variety of powers and properties, which they never exhibit when viewed in the aggregate. Yet infinitely minute as these atoms may be, only class them with matter, and those speculatists who talk of their properties, will always imagine that they are talking of things which they see [o], or which may be seen; of things which are, or which may be made the objects of sense; which may in time be proved by experiments, and brought within the powers of their comprehension.

But if any atoms of any description, visible or invisible, which have been mentioned since the days of Leucippus, were possessed of the powers of organizing animals or plants, we might naturally expect it in those atoms which compose the bodies of atomical philosophers: for, these philosophers not only admit, but are anxious to prove, that their bodies owe their existence entirely to atoms; and that all their powers, sensitive and rational, as well as their bodies, are nothing more than the mere results of an infinite number of minute atoms combining their forces. From such data we might be naturally led to infer, that their bodies, from being large and perfectly organized, should, when collected into numerous assemblages, and with such advantages in point of power, skill, and dexterity, over the rude atoms that formed them, be capable, on combining their concentrated forces, to produce other organisms more extraordinary: and yet what is the fact? With every inclination to combine their energies, skill, and dexterity, we have not upon record a single well authenticated document, that they have ever succeeded in organizing even an animal or a vegetable fibre. How then can it serve the hypothesis of these philosophers to endow their separate atoms with lives, when even hundreds of their own lives, although each combining the concentrated energies of infinite numbers of individual atomical lives, are notwithstanding totally incapable, not to say of producing, but even of accurately imitating any thing that has yet been denominated an organized structure? They ought to have considered, that, in endowing their atoms with lives for performing such offices, they should at least have endowed them with such as were adequate to the task; that is, with lives in every respect superior to their own, in genius and intellect; in energy, foresight, chemical science, mechanical invention, and every other species of art and contrivance.

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[o] See above, p. 183.

Buffon, however, who does not appear to have known the varieties of Hylozoism [p] among the an-

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[p] "We have described," says Cudworth, "four several forms of atheism; first, the *hylopathian* or *anaximandrian*, that derives all things from dead and stupid matter, in the way of *qualities* and *forms*, generable and corruptible: secondly, the *atomical* or *democritical*, which doth the same thing in the way of atoms and figures: thirdly, the *cosmoplastic* or *stoical* atheism, which supposes one plastic and methodical, but senseless nature, to preside over the whole corporeal universe: and lastly, the *hylozoick* or *stratonical*, that attributes to all matter, as such, a certain living and energetic nature, but devoid of all animality, sense, and consciousness." *Intellectual System*, p. 134.

"Indeed we are not ignorant, that some, who seem to be well-wishers to atheism, have talked sometimes of sensitive and rational matter, as having a mind to suppose three several sorts of matter in the universe, specifically different from one another, that were originally such, and self-existent from eternity; namely, *senseless*, *sensitive*, and *rational*; as if the mundane system might be conceived to arise from a certain jumble of these *three* several sorts of matter, as it were scuffling together in the dark, without a God, and so producing brute animals and men. But as this is a mere precarious hypothesis, there being no imaginable accompt to be given, how there should come to be such an essential difference betwixt *matters*, or why this piece of matter should be *sensitive*, and that *rational*, when another is altogether *senseless*; so the suggestors of it are but mere novices in atheism, and a kind of bungling well-wishers to it. First, because, according to this hypothesis no life would be produced or destroyed in the successive generations and corruptions of animals, but only concreted and secreted in them; and consequently, all human personalities must be eternal and incorruptible: which is all one as to assert the præ and post-existence of all souls, from eternity to eternity; a thing that all genuine and thorough-paced atheists are in a manner as abhorrent from, as they are from the deity itself. And, secondly, because there can be no imaginable reason given by them, why there might not be as well a certain cients, is content with the lowest species of life for his nutritive particles; and so partial is he to this lowest degree of it, that sometimes, forgetful of the advantages which all his hypotheses derive from organism, he thinks, that instead of dividing matter into organized and brute matter, the general division ought to be into living and dead matter; for, "that what is called brute matter is nothing but matter produced by the death of animals and vegetables, might be proven," he says, "from the enormous quantities of shells, and other relics of living bodies, which constitute the principal part of stones, marbles, clays, marles, earths, turfs, and other substances that are commonly reckoned *brute matter*, but are in reality composed of decayed animals and vegetables[q]." Dead or brute matter, it therefore appears, is, in his opinion, derived entirely from animals and vegetables. Now, whence is his living matter derived? In answer to this question, it is obvious, from his own experiments and inquiries, that he had never seen, and had never heard of any living and organic particles, except in animal and vegetable fluids, or infusions of animal and vegetable substances. His living matter,

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divine matter perfectly intellectual and self-existent from eternity as a *sensitive* and *rational matter*." *Intellectual System*, p. 137.

[q] P. 36. The author here, proceeding to reason on the supposition that the living and the dead are two distinct species of matter, instead of two different states of the same matter, involves himself afterwards in the strangest inconsistencies and contradictions, though he would certainly have been equally unfortunate had he reasoned on the supposition that brute and organized matter are distinct species.

therefore, like his dead, is derived also from animals and vegetables; so that all matter, whether living or dead, is nothing but animal or vegetable matter. Our author, indeed, would at one time have us to believe that his living and organic particles existed originally in the food; but, upon inquiring into what is the food of an animal and vegetable, he informs us that the animal is nourished by vegetable substances; and that the vegetable is nourished by the same substances in a decomposed state[r]. The food, therefore, cannot possibly be any thing but either animal or vegetable matter; and beyond that our author has not traced any of his living and organic particles. Besides, as animal and vegetable bodies are not usually alive when they become the articles of food, it should follow again that his dead and his living matter are precisely the same; and that, had he ventured no farther than his experiments and observations led him, he ought to have concluded that animals and vegetables are the only beings which are capable of organizing matter, or communicating life either to its masses or its separate particles.

Had Buffon wished to prove, or had he known the manner in which the proof could have been established, that the lives of his nutritive and organic particles were independent of animals and vegetables, he ought to have shown that there are such particles in the mineral kingdom; and that, being all of the same kind, every species of plant and animal might be fed entirely upon mineral substances. But, instead of this, what does he do? He continues to reason upon the distinction which he has drawn between living and dead matter; and although he has acknowledged that animals and vegetables live upon dead animals and vegetables, in other words, upon dead or brute matter, we find him suddenly changing his opinion, and maintaining that *dead* or *brute matter* is not susceptible of organization; for, "nature," he says, "would know no bounds in the production of organized bodies, if her progress were not obstructed by matter which is not susceptible of organization; and this is a full demonstration, that she has no tendency to increase brute matter[s]." It is, therefore, he thinks, "extremely probable, that in the bodies of animals and of vegetables a separation is made between the *brute particles* of the aliment and the *organic;* and that nothing but the organic particles remain[t]." But here again we may reasonably ask, what are the organic particles of the aliment? Does not the whole aliment consist of either animal or vegetable matter, and that generally in the state of dead, or of what, upon the preceding hypothesis must be reckoned synonymous, brute matter[v]? Our author, at times, has no reluctance to admit the conclusion which these questions would imply; and, on taking another view of the subject, is inclined to think, that dead matter, which he lately supposed not to be susceptible of organization, may now, as well as his living particles, be essential to the processes of reproduction. Accordingly, he observes that the cause of destruction "seems to derive from destruction itself fresh powers of multiplying; for assimilation, which is one cause of death, is at the same time a necessary mean of producing life [w]."

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[r] Vol. ii. p. 252.

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[s] Ibid. p. 35.

[t] Ibid. p. 42.

[v] Even most manures consist of what our agriculturists reckon dead matter, as shells, lime, marles, marbles, clays, and turfs; and so far is fire from destroying their qualities in that

On this change of hypothesis [x], he proceeds to show that animals and vegetables, the only beings which were proved by his experiments to be the causes of organization, are, for that very reason, the greatest destroyers of organized structures [y]. For, "in general," he says, "beings which have the power of converting matter into their own substances, or of assimilating the parts of other beings, are the greatest destroyers. Fire, for example, which converts almost every species of matter into its own substance, is the greatest source of destruction that we are acquainted with. Animals seem to partake of the nature of flame; their internal

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capacity, that even when reduced to powder by its action, they only become more energetic.

[w] Ibid. p. 37.

[x] This hypothesis is not new: an axiom of the ancients, which he has quoted, was, "corruptio unius, generatio alterius."

[y] It is here to be remembered, that his living and organic particles were at one time supposed to be primary indestructible elements.

heat is a species of fire next to flame. Accordingly, animals are the greatest destroyers; and they assimilate and convert into their own substance all bodies which can serve them for nourishment[*]."

In this way, although animals and vegetables be the only beings, so far as we know, employed by nature to organize the particles of matter; yet, according to our author, they, at the same time, are the only beings which oppose her intentions, in extending the processes of organization, for, "it may be safely affirmed," he says, "that if all matter is not organized, it is only because organized beings destroy one another; for we can increase, at pleasure, the number of animals and vegetables, but we cannot augment the quantity of stones or of dead matter[a]. This appears to indicate that the most ordinary and familiar operation of nature is the production of organized bodies; and here her power knows no limitation[b]." In using this language, he entirely forgets one of his assertions, that stones, marbles, clays, marles, earths, and turfs, are principally composed of decayed animal and vegetable matters; and that consequently both animals and vegetables contribute to augment the quantity of stones and of dead matter. He also forgets another assertion, that brute or dead matter is not susceptible of organization. Taking this for granted, how does it follow that nature, in the production of organized bodies, knows no limitation? Do we not learn from his own confession, nay from the statements which he labours to support, that the element of fire can resist the extension of this power; and that plants and animals, nearly allied to this very destructive element, continually and successfully resist such extension while they are alive; and even when converted into dead matter persevere in an equally successful opposition, letting nature know that when they are dead or brute matter, they are not susceptible of organization. Resisted therefore, and resisted successfully by all that is living and all that is dead, this power, which is said to know no limitation, should rather be described as a power that is limited on every side, and by every thing which is known to exist. But as this view will not suit our author upon every occasion, he sometimes represents it as exerting an almost omnipotent influence over all that is dead and all that is alive; causing destruction to derive even from destruction itself fresh powers of multiplying; and making assimilation, which is one cause of death, to be at the same time a necessary mean of producing life. Arriving at this singular conclusion, that life and death mutually support and generate one another, and that both originate from the same power of organization, he comes to another, still more extraordinary, that we can communicate life at pleasure, and to any extent, but have not the power of taking it away; or, to express it in his own words, "we can increase, at pleasure, the number of animals and vegetables, but we cannot augment the quantity of stones or of dead matter."

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[*] P. 37. It is not the fact, that almost every species of matter is combustible, and yet it is only combustible matter which supports fire: besides, fire does not organize combustible matter, nor any kind of matter; it organizes nothing, disorganizes every thing over which it has unlimited influence. Nor does it convert any thing into its own nature; it is only the means of bringing into action inflammable matter, which had been in a state of conversion before. In this instance, as in many others, the want of precision in Buffon's ideas is strikingly remarkable. Whenever the ancients ascribed the phenomena of life to the principle of heat, they were careful to distinguish accurately the different species of that principle. "Præsertim cum is ardor, qui est mundi, non agitatus ab alio, neque externo pulsu, sed per se ipse ac sua sponte moveatur." *Cicero de Nat. Deor.* lib. ii. § xi.

"Atque hic noster ignis, quem usus vitæ requirit, confector est et consumptor omnium, idemque, quocunque invasit, cuncta disturbat ac dissipat. Contra ille corporeus, vitalis et salutaris, omnia conservat, alit, auget, sustinet, sensuque afficit." Ibid. § xv.

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[a] The art of increasing at pleasure the number of useful animals and vegetables, must have been extremely valuable. It seems, however, to have been known only to Buffon, and necessarily implied that he had another art, the art of providing them abundantly with food.

[b] P. 34, 35.

From these specimens of philosophical talents, and abstract reasoning, in this justly celebrated writer, it is evident that a mind may be stored with numerous and important facts; be possessed of a brilliant and exuberant fancy; be endowed with the fascinating powers of eloquence; excel in vividly descriptive narrative; be capable of great patience and industry; and enriched with such versatility of genius, as to be equally ardent and active, whether studying with Pliny the objects of nature, or conversing with

Newton on the doctrine of fluxions[c]; yet, after all, such a mind may be destitute of those talents which, according to Aristotle, constitute the νους, the το θειότερον, that nobler and diviner part of the soul which, rising superior to the objects of sense[d], the fashions of the time, and the early prejudices imbibed from the nurse, did, in those of Bacon, Newton, and Locke, trace effects to causes, and causes to effects, through a chain of intimately connected links, until it arrived at a first cause of separate and independent existence; a cause supporting and governing the universe with infinite power, intelligence, and foresight.

SECTION XI.

OPINIONS OF NEEDHAM.

ENGLAND has to boast of at least four authors of the name of Needham: Marchamont, who, much devoted to politics, was the editor of a paper called Mercurius Britannicus; Walter, a physician, who wrote a treatise De Formato Fœtu; Peter, a divine, a learned editor of Hierocles, and of the Geoponica; and Turberville, whose opinions relate to the subject of our present inquiry[e]. Turberville, probably of a catholic family, was educated at Douay, was afterwards a professor of its university, a distinguished member of the order of Jesuits: he was much and generally esteemed for his piety, and of such reputation in the scientific world, that he was elected by the Royal Society of London one of its fellows, and is said to have been the first catholic priest who received that honour. Being much on the continent, he became known to most of the literary men of his time; was personally acquainted with Spallanzani; conducted with Buffon a variety of experiments on animal and vegetable infusions; and lived in such intimacy with that celebrated naturalist, that when they performed their experiments separately, every observation which occured to the one was freely communicated to the other[f]. Buffon, however, in relating these experiments, in the second volume of his Natural History, although he alludes to some occasional assistance from Needham, yet impresses his reader with an idea that these experiments as well as observations were principally his own. Needham appears to have felt disappointed at this conduct; and therefore, in order to assert his own claims, and reserve to himself the privilege of reasoning from his own observations, he resolved to publish a French translation of his Letter to Folkes, with the intention of confining himself to a narrative of facts; but after the narrative was put to the press, he changed his intentions, determined to make several additions, to draw his conclusions, and to show that his views extended much farther than those of Buffon, which had been restricted to the establishment of his own theory[g].

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[c] He wrote the preface to the French translation of Newton's Fluxions, which he mentions in a note, p. 25.

[d] See above, note u, p. 183.

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[e] These opinions were originally published in English, in the form of a letter, addressed to Mr. Folkes, president of the Royal Society of London. The French edition to which I refer, bears the title of *Observations Nouvelles sur la Génération, la Composition et la Décomposition, des Substances Animales et Végétales,* and forms by far the most considerable part of a duodecimo volume, which was published at Paris in 1750, under the general title of *Nouvelles Observations Microscopiques, avec des decouvertes intéressantes sur la Composition et la Décomposition des Corps organisés.* Par M. Needham, de la Societé Royale de Londres. The French edition of Needham's letter to Folkes is more than a translation; it is greatly enlarged and improved, with copious notes by the author, on several passages, wherein his language, as he seems to insinuate, had not unfrequently been wilfully misinterpreted.

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[f] Needham, alluding to the discoveries which were the result of these experiments and observations, says, "Il y en a quelques-unes (découvertes) qui ont été faites par lui (Buffon) seul, d'autres par moi en particulier, et enfin il y en a que nous avons faites de concert. Son systeme, ses expériences, mes propres découvertes, mes idées en conséquence de ces découvertes, tout cela étoit communiqué réciproquement; nous n'avions aucun secret l'un pour l'autre." P. 201, 202.

[g] "Mon premier dessein étoit simplement de séparer mes expériences de celles de M. de Buffon, afin que je pusse tirer les conséquences qui paroissoient en résulter immédiatement, et raisonner en liberté sur ce que j'avois observé.

"Comme elles sont dispersées dans le second volume de l'Histoire Naturelle de M. de Buffon, elles ne servent absolument qu'à appuyer sa théorie, et elles n'y sont rapportées que

Needham's theory properly begins where Buffon's ends[h]. Both agree in denying the preexistence of germs[i]; in maintaining the corruption of one body to be the generation of another; in ascribing to nature expansive forces, thought necessary to expand animals and plants during their growth; resisting forces to preserve cohesion, to prevent dissolution, and thus to regulate the expansive forces; penetrating forces, such as gravity, repulsion, and attraction; and lastly, a productive or vegetative force, not accurately defined, nor easily distinguished, except in name, from

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comme une suite de ses expériences, sans figure pour les expliquer, et sans aucun ordre particulier." Preface, p. i.

"Mon dessein étoit alors de ne donner en François que ce qui avoit paru en Anglois, et de réserver toutes les additions que j'avois à faire pour un autre ouvrage; l'imprimeur avoit même déja commencé cette édition, lorsque je changeai de résolution à cet égard." Preface, p. v.

[h] "Mes observations et ma théorie commencent précisément ou il a jugé à propos que les siennes finissent." P. 202.

[i] "Il est tems maintenant de reconnoître combien je suis redevable à la pénétration de M. de Buffon, qui m'a le premier engagé dans cette recherche, par son système ingénieux qu'il a eu la bonté de me lire, avant que j'en eusse moi-même la moindre idée, ou que j'eusse fait aucune expérience. Il y avoit longtems que l'opinion des germes préexistans ne le satisfaisoit pas, non plus que quelques autres sçavans, comme M. de Maupertuys, Président de l'Academie des Sciences de Berlin. Nous avons différentes objections contre ce systéme, dans un petit livre que M. de Maupertuys à publié lui-même à Paris sur cette question, avant que j'y fusse arrivé; en un mot, c'est par des réflexions générales, et quelques autres idées conséquentes, que M. de Buffon a été conduit à former son système des parties organiques." P. 184.

the plastic nature of the Aristotelians, the venus genetrix of Lucretius, or the modern venus physique of Maupertuis[k].

These powers, though the mere creatures of mental abstraction, were, as we have seen, considered by Buffon as sufficient to account for all the obvious phenomena in nature, and on that account were viewed by him as the ultimate boundaries of rational inquiry. Needham, however, upon this subject, entertained a different opinion: he thought that these powers required to be directed, and saw what to him was proof irresistible of design and intelligence in their modes of operation; but as he could not ascribe intelligence to the powers themselves, he was necessarily induced to look beyond them when he traced their phenomena to a being invisible and uncreated, who plans by his wisdom, and directs by his influence, all the operations in which they are employed. Instead therefore of considering these powers as the properties of matter, or matter itself as an ultimate cause, composed of indestructible particles, possessing a species of life and organism, he was of opinion that its life and organism are only accidental; and that no matter, not even animal and vegetable, has ever been observed to possess either properties or affinities which can be strictly denominated inherent or permanently specific[1]. While of this opinion, for it is his opinion only at times[m], and while he perceives that all animals feed upon plants, and plants upon inanimate matter, Needham is led to suppose that all matter is ultimately the same, differing only in its modes of arrangement and states of refinement, which it exhibits according to a scale, which he denominates the scale of nature, and divides into what he terms degrees of exaltation. At the bottom of this scale, matter is without any arrangement; but, higher in the scale, is found organized, and then *vitalized;* exhibits in its progress first simple motions, then motions which are evidently spontaneous, at last becomes obviously sensitive, displaying instincts, appetites, passions, and other phenomena, in proportion to the state of its organism, and the extent to which it is impregnated by active principles. Hence his conclusion, that the first appearance of natural mechanism indicates a certain degree of life; and its first motion, however obscure, if it proceeds from internal causes, is the same in kind, though not in degree, as the most perfect animal vitality[n].

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[k] « Il y a dans la nature des principes résistans qui se combinent avec la force expansive dans la constitution de chaque corps organisé." P. 280.

« Les substances ou combinaisons physiques, se pénétrent mutuellement jusqu'à leurs parties intégrantes, et sont l'une à l'égard de l'autre des principes secondaires de résistance ou d'expansion, suivant leurs différentes constitutions." P. 281.

« Il y a une force réelle productrice dans la nature." P. 216.

« Il paroit donc évident qu'il y a une force végétative dans chaque point microscopique de matiére, et dans chaque filament visible, dont toute la contexture animale et végétale est composée." P. 241.

« Il résulte de tout ce que nous avons dit. 1°. Qu'il y a des principes actifs dans l'univers qui produisent de leur propre nature cet effet que nous appellons mouvement. 2°. Qu'il y a un milieu parfaitement élastique, et qui n'apporte presque aucune résistance, qui est doué d'un mouvement intestin continuel, et qui par conséquent est expansif en tous sens. 3°. Qu'il y a des principes de résistance dans la nature, qui par leur propre force s'opposent au mouvement, ou qui suspendent cette espece d'action qui le produit. 4°. Que tous les composés physiques de quelque espece qu'ils soient ne sont que des différentes combinaisons de principes opposés. 5°. Que tout se fait par gradation dans la nature, qu'aucune cause, quelque foible qu'elle soit, n'agit en vain; suivant cette loi d'Huyghens dont nous avons déja parlé. Car il n'en est pas de ce systême, comme de celui d'une matiére absolument inactive, où de grands effets doivent être attribués à des causes très-legeres. Une cause foible produit ici un grand effet, mais ce n'est pas par elle-même, c'est en sollicitant un principe actif étranger qui est autour d'elle." P. 320, 321.

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[1] "Il est vrai que chaque particule dans la génération est susceptible de toute analogie, et peut s'allier avec un corps organisé, ou avec une partie quelconque d'un corps organisé, selon qu'il plaît à la nature d'en disposer. Et des analogies originaires permanentes, inaltérables, entre particules et particules, sont non seulement contraires à l'observation, comme nous l'avons vu ci-dessus, et contraires aux changemens qui arrivent aux substances animales et végétales indifféremment, mais elles

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ont aussi tous les inconvéniens des germes préexistans, et des linéamens inaltérables." P. 309.

[m] "L'essence de toute substance est fixée en action spécifique, et les phénomenes qui s'observent entre substance et substance, sont le résultat de l'action mutuelle." P. 359.

[n] "Je me servirai souvent de ce terme (*exaltation*.") ----Je suppose la matiere continuellement susceptible *d'exaltation*, toujours dans le même ordre, tandis qu'elle tend à se décomposer." P. 210.

"Pour que mes lecteurs entendissent parfaitement toute ma dissertation et le systême que j'établis, je voudrois qu'ils eussent perpétuellement en vue cette parfaite gradation.—De même si on raisonne avec moi sur la matiere, on doit la con-

In corroboration of these opinions, he quotes Milton, who, having adopted the ancient hypothesis respecting prime matter, and believing the fabulous reports of the alchemists concerning the transmutation of metals, has endeavoured to ex-

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siderer dans chaque dégré de subtilité et d'exaltation, jusqu'à ce qu'elle soit mise en action par quelque principe supérieur, et que par *une organisation visible ou invisible,* elle reçoive un principe de vie, soit spontané ou non spontané. Après cette application, on conçevra aisément que le *méchanisme naturel lui-même est un dégré de vie et d'activité,* si on prend le mot de vie dans le sens le plus étendu." P. 187.

"J'étois porté par plusieurs raisons à embrasser ce sentiment, mais sur-tout, parceque je pensois qu'il étoit très-raisonnable d'admettre une échelle qui s'étendroit sur toute la nature. Les lignes d'intelligence, de sensation, de vitalité, de simple mouvement, se suivent l'une l'autre dans une gradation naturelle." P. 188.

"Il paroîtra dans la suite que des substances animales ou végétales mises en digestion, prennent peu à peu un autre arrangement de parties, végétent en de nouvelles formes, et reçoivent successivement un principe de vie.---Je dis plus, qu'y a t'il en cela de plus incroyable que ce qui arrive à un morceau de pain, qui après la digestion se *vitalise* en moi, et devient une partie de ma substance?---Il y a un tems où le fœtus n'est pas animé, et l'animation n'a pas lieu que le réceptacle, qui étoit une matiére morte et inactive, n'y soit préparé par la végétation." P. 177.

"Je raisonnai ainsi en moi-même; il paroît évident par toutes les observations que j'ai faites jusqu'ici, que dans l'échelle de la nature il n'y a qu'un dégré de distance entre la derniere espece de *vitalité* animale et la premiere de *vitalité* végétale." P. 224. In the same note he speaks of a substance "prête a se vitaliser," as being ready to vitalize itself, or to be vitalized, and of the milky juice of a young grain, as being in the highest degree of vegetative force, and consequently highly impregnated with active principles. "Le suc laiteux du jeune grain est dans sa plus grande force végétative, par consequent fort impregné de principes actifs."

plain on similar principles how corporeal substances may be gradually sublimed into those which are spiritual, sensitive, and rational[o].

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[o] The passage in Milton, which Needham has quoted and translated, is to be found in the fifth book of Paradise Lost, beginning at line 479, and ending at line 488:

"So from the root
Springs lighter the green stalk," &c.

As this passage, however, developes only a small part of the theory of Milton, I shall take the liberty of subjoining a more copious extract, which will show that Needham, as well as Bonnet, had been anticipated in most of the ideas which he had formed of a scale of nature. In descending this scale, all matter, according to Milton, becomes gradually grosser and grosser, but in its return (for he, like the ancients, makes it to ascend as well as descend) it becomes gradually purer and purer, and is, when at the summit, converted into a substance incorporeal and spiritual.

———Heav'nly stranger, please to taste
These bounties, which our Nourisher, from whom
All perfect good, unmeasur'd out, descends,
To us for food and for delight hath caus'd
The earth to yield; unsavoury food perhaps
To spiritual natures; only this I know,
That one celestial Father gives to all.
To whom the Angel. "Therefore what he gives
(Whose praise be ever sung) to Man in part
Spiritual, may of purest Spirits be found
No ingrateful food: and food alike those pure
Intelligential substances require,
As doth your rational; and both contain
Within them every lower faculty
Of sense, whereby they hear, see, smell, touch, taste,
Tasting concoct, digest, assimilate,
And corporeal to incorporeal turn.
For know, whatever was created, needs
To be sustain'd and fed; of elements
The grosser feeds the purer, earth the sea,

According to this view of the subject, matter must be held as totally inert; as equally susceptible of every form, every arrangement, every combination, and be so modified as to be constituent of every structure, whether mineral, animal or vegetable, artificial or natural, corporeal or spiritual. To the obvious question, What produces these forms and arrange-

Earth and the sea feed air, the air those fires
Ethereal, and as lowest, first the moon;
Whence in her visage round those spots, unpurg'd
Vapours not yet into her substance turn'd.
Nor doth the moon no nourishment exhale
From her moist continent to higher orbs.
The sun, that light imparts to all, receives
From all his alimental recompense
In humid exhalations, and at even
Sups with the ocean. Though in Heav'n the trees
Of life ambrosial fruitage bear, and vines
Yield nectar; though from off the boughs each morn
We brush mellifluous dews, and find the ground
Cover'd with pearly grain: yet God hath here
Varied his bounty so with new delights,
As may compare with Heaven; and to taste
Think not I shall be nice." So down they sat,
And to their viands fell; nor seemingly
The Angel, nor in mist, the common gloss
Of Theologians; but with keen dispatch
Of real hunger, and concoctive heat
To transubstantiate: what redounds, transpires
Through Spirits with ease; nor wonder, if by fire
Of sooty coal, th' empiric alchemist
Can turn, or holds it possible to turn,
Metals of drossiest ore to perfect gold
As from the mine.

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Thus, when with meats and drinks they had suffic'd,
Not burden'd nature, sudden mind arose

ments, and all their varieties of specific combinations? Needham replies, the vegetative power, the expansive, penetrating, and resisting forces, diffused throughout nature. To the following question, How does it happen that these forces do not always produce similar forms and similar arrangements? his answer is, that these forces are

In Adam, not to let th' occasion pass,
Giv'n him by this great conference, to know
Of things above his world, and of their being
Who dwell in Heav'n, whose excellence he saw
Transcend his own so far, whose radiant forms
Divine effulgence, whose high pow'r so far
Exceeded human, and his wary speech
Thus to th' empyreal minister he fram'd.
"Inhabitant with God, now know I well
Thy favour, in this honour done to Man,
Under whose lowly roof thou hast vouchsaf'd
To enter, and these earthly fruits to taste,
Food not of Angels, yet accepted so,
As that more willingly thou couldst not seem
At Heav'n's high feasts to have fed: yet what compare?"
To whom the wing'd Hierarch reply'd.
"O Adam, one Almighty is, from whom
All things proceed, and up to him return,
If not deprav'd from good, created all
Such to perfection, one first matter all,
Endued with various forms, various degrees
Of substance, and, in things that live, of life;
But more refin'd, more spiritous, and pure,
As nearer to him plac'd, or nearer tending,
Each in their several active spheres assign'd,
Till body up to spirit work, in bounds
Proportion'd to each kind. So from the root
Springs lighter the green stalk, from thence the leaves
More airy, last the bright consummate flower
Spirits odorous breathes: flow'rs and their fruit,
Man's nourishment, by gradual scale sublim'd,

differently combined, and that the diversities of their combinations occasion diversities of form and structure. To a third question, What has been the cause of these combinations, and what has preserved them specifically distinct for so many thousands of successive generations? he replies, that the creator of the universe, when he constructed the original organisms of each species, bestowed on each a specific combination of forces; that each organism, serving as a matrix, might communicate a similar combination to its offspring[p]; or, in other words, the matrix was made

To vital spirits aspire, to animal,
To intellectual; give both life and sense,
Fancy and understanding; whence the soul
Reason receives, and reason is her being,
Discursive, or intuitive; discourse
Is oftest yours, the latter most is ours,
Differing but in degree, of kind the same.
Wonder not, then, what God for you saw good
If I refuse not, but convert, as you,
To proper substance: time may come, when Men
With Angels may participate, and find
No inconvenient diet, nor too light fare;
And from these corporal nutriments perhaps
Your bodies may at last turn all to spirit,
Improv'd by tract of time, and wing'd ascend
Ethereal, as we, or may at choice
Here or in heav'nly Paradises dwell;
If ye be found obedient, and retain
Unalterably firm his love entire,
Whose progeny you are."

Book v. line 397—503.

[p] "Quoique je ne prenne les choses que d'une maniere générale, je vois cependant la source d'une variété, qui seroit sans bornes si on lui laissoit une pleine liberté, mais qui est invaria-

to combine the forces, and the forces afterwards made to construct the matrix. To Ocellus Lucanus and others who believe that the world is eternal, and that all events revolve in a circle, this mode of reasoning, by which cause and effect are made to produce one another alternately, might be quite satisfactory. But this idea of all events revolving in a circle is totally inconsistent with the idea which Needham has formed, of a scale of nature extending in a direct line from the lowest creature towards the creator. Agreeably to his idea of the scale, the incipient matrix has very few powers to communicate; all its powers are derived, and acquired gradually as it advances through the successive degrees of exaltation. Nor are their combinations or proportions permanent, but varied with every change of organism which is accompanied with new im-

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blement restreinte par le créateur et le conservateur de l'univers, à un certain nombre d'especes." P. 246.

"La sémence du mâle et de la fémelle doit être spécifiquement et même numériquement déterminée dans chaque individu, en conséquence de sa nature, de sa constitution, de sa nourriture, du climat, et d'autres circonstances évidentes, qui donnent des différences ou très-grandes et spécifiques, ou moins considérables et accidentelles." P. 248.

"La formation d'une semence présuppose donc nécessairement un corps organisé, ou, dans ces dernieres classes, quelque matrice déterminée dans une suite rétrograde, qui s'éleve jusqu'a l'origine de ce monde visible, et à cet ordre d'etres qui est immédiatement sorti des mains de Dieu." P. 249.

"Dans toute matrice où la nature produit des corps organisés, tout est auparavant déterminé, la source, les premieres principes, la quantité de nourriture." P. 285.

pregnations. But here, if the organism precede the powers, may it not be asked, What is the cause which precedes the organism, who forms it, who watches over its progress, and who prepares it for the new impregnations? Needham seems inclined rather to evade than to answer these questions. He thinks that, on a physical view of the subject, where conclusions are made to rest principally on the evidence of the senses, the organism appears to precede the powers, although, in a metaphysical view, where objects are seen through the internal as much as through the external senses, action appears to precede organism, as necessarily as the cause precedes its effect, or an object the idea which it excites[q]. After stating, however, the difference between the views which are presented by physics and metaphysics, it is somewhat singular that he has not attempted to reconcile them, or to ascertain which of the two is the most general, or the most correct; but having proceeded on the supposition that both may be equally general and correct, has chosen to reason sometimes from the one and sometimes from the other; a method which has led him to draw conclusions not only inconsistent but even contradictory. Taking his metaphysical view, and supposing that action is anterior to organism, what action is it? is it the action of his vegetative, expansive, and other forces? Admitting that it is, and that these forces prepare the organism for the reception of additional forces and additional combinations, yet what is it that regulates the forces? what combines them? what modifies them? what varies their proportions? what applies them? and what marks the time when the organism is ready for their reception? To meet these queries, Needham has recourse to a new hypothesis: he now informs us that there are two scales in nature, a scale of simple agents, and a scale of combinations[r]; that the simple agents are not only numerically but specifically distinct; and that there are multitudes of these agents, intermediate between the deity and matter, and very different from either the deity or the thinking soul[s]; that action from without necessarily implies the existence of an agent[t]; that though artificial machines be moved only by external causes, natural machines or organised bodies are moved by a certain activity within; that this activity proceeds from a principle which may be denominated a *vital principle*, a principle which, independent of either configuration or matter, extends its influence over the nutritious particles around it, as fire does over combustible materials, and which assimilates these particles in a regular manner, as the increase of action in the germ must be regular, because its powers always increase in a certain invariable order; an order proceeding from principles of action which are all previously and specifically determined, not only in the germ, but in the matter to be assimilated, preparatory to new changes of form [u].

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[q] "Je dis dans un sens métaphysique, que l'action est antérieur à l'arrangement, comme une cause à son effet, ou l'objet à son idée." P. 427.

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[r] « Toute la nature est variée, non seulement dans une échelle d'agens simples ou de premiers principes, mais aussi dans une échelle de combinaisons." P. 342.

[s] « C'est au moins une vérité incontestable qu'il y a des multitudes d'agens hors de nous qui produisent ces impressions, et qui sont distincts en nombre et en qualité, si nous pouvons juger des causes par les effets, et par conséquent autant d'etres secondaires intermédiaires très différens de Dieu, ou de l'ame pensante." P. 327.

[t] « L'action extérieure ne peut subsister que dans un sujet agissant." P. 328.

According to this hypothesis, vitality depends not on the state of the organism, nor upon the action and reaction of forces [v], nor upon the materials of any matrix, be it a globule, a filament[w], or a seed, as these materials are merely portions of either animal or vegetable matter in some of the higher degrees of exaltation[x]. It depends upon a principle which owes its existence neither to configuration nor material causes, and which from its nature cannot exhibit any of its powers to our bodily senses, except through the medium of corporeal organs, but which may exist independent of such organs, or may even exist in the midst of such organs without exercising any of its powers, except those which maintain the system in a state of preservation for resuming its functions when the obstructing causes are removed[y]. In short, this

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[u] « Dans les machines artificielles, le principe du mouvement, aussi bien que les effets, est extérieur, et non pas substantiellement intime - - - - Mais la force des machines naturelles, même de moins composées, qui vient d'une activité intime, qui penétre leur propre substance, est bien supérieure au méchanisme commun: et si on remonte à sa source, on trouvera *qu'elle est indépendante de la configuration, ou de toutes causes matérielles*, quoiqu'elles puissent l'exciter, la diriger, et la distribuer. *Si donc nous voulons avoir une juste idée de ces etres, nous devons considérer le principe qui leur donne l'activité, comme un principe vital,* et un dégré d'animation, ce qui est fort different de ce que je pensois autrefois." P. 194.

« C'est une étincelle vitale qui gagne peu à peu sur la nourriture environnante, comme le feu sur les matieres combustibles; et l'assimilation est réguliere, parceque l'accroissement d'action doit être régulier, par une augmentation continuelle de puissance, dans un certain ordre invariable; là où les principes d'action étoient spécifiquement déterminés auparavant; non seulement dans le germe, mais dans la matiere assimilable elle-même qui prend alors une nouvelle forme." P. 429.

[v] « J'ai observé ci-devant, mais il ne sera pas hors de propos de le répeter ici, qu'un corps organisé est un systême d'action

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et de réaction complet dans chaque partie, et que c'est delà que dépend sa vitalité parfaite." P. 421.

[w] "Toutes les substances infusées ou macérées ne sont pas également tenaces et ductiles, et ne donnent pas toujours des filamens distincts de quelque longueur, qui sont les matrices des animaux futurs." P. 305.

In vegetable infusions these filaments were observed, through the microscope, dividing themselves into numbers of globules, which were full of life, and showed a variety of spontaneous motions. See page 129 of this inquiry.

[x] "La semence n'est qu'une portion exaltée de substance animale ou végétale." P. 299.

[y] Speaking of the filaments which appear in vegetable infusions, he observes, "que leur principe de vie reste pendant longtems parfaitement inactif, tandis que les corps organisés sont dessechés, et qu'il entre en action dès qu'une humidité suffisante met en liberté leur substance qui s'étoit resserrée." P. 227. It is generally known that the seeds of plants, and even many species of mosses may, by a suitable application of moisture, be brought into action, and made to exhibit their

ypothesis, bating the pre-existence of germs, is n all respects the same as that of evolution; and herefore if we mean to follow Needham, we are ow to understand that the organism is formed, ot by additions of new forces or new combinaions, or by any gradually acquired properties, such s motion, spontaneity, vitality, sensation, but by a ertain active principle residing within, possessng specific and inherent powers of various kinds, ome of which it constructs the organs through which its remaining powers are displayed. On this upposition, the state of the organism will be in proportion to the development of the organizing principle; and the display which this principle makes of its powers, will be in proportion to the intensity of these powers, and the state of the organs through which it exhibits them; a state which will depend not simply upon the structure of the organism, but upon a variety of modifications arising from the influence of both external and internal causes.

The internal principle of life and sensation is supposed by Needham to perish with the body, while another principle peculiar to man, and said to animate the body also, is supposed to survive it. The former of these belonging to a genus common to

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vital phenomena after being long in a dried state; yet here temperature is as necessary as moisture, and therefore eggs, many species of plants, many of insects, and many even of the warm-blooded animals, become torpid during the cold season of winter, and remain long in a state of inaction, from a deficiency of temperature, or of those specific changes of temperature in the ambient air, which are requisite for the due exercise of their functions.

man, and the lower animals, is the sensitive soul, the latter the rational, or the intelligent, which is said to derive all its knowledge from sensation, or in other words, from the sensitive soul[z]; yet being observed, by its power of comparison, to form those ideas which are termed negative, and which cannot be traced either to sensation or external impressions, he maintains that these negative ideas are a demonstration that the principle which forms them is totally independent of corporeal structure, and even of the soul from which it derives its positive ideas[a]. In a former hypothesis, wherein he supposed that the vital phenomena common to man and the lower animals were the effects not merely of organism, but of certain forces with which, in its progress towards completion, it is gradually impregnated, he thought he could explain without the imputation of being a materialist, how these forces might again be dispersed, and all the effects arising from their combined operation cease to exist as the organism gradually fell into decay; but upon this newly adopted hypothesis, that these phenomena proceed from a principle totally independent of configuration and material causes, a question, he foresaw, would naturally arise, what becomes of this principle at death?

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[z] "Nos connoissances viennent entièrement des sensations." P. 322.

[a] "L'ame intelligente, ou l'agent qui a la faculté de comparer, est évidemment quelque chose de fort différent, un etre simple totalement distinct dans son essence, et sa nature, du systême corporel qu'il anime." P. 325.

"Si l'agent qui a la faculté de comparer n'étoit pas un etre totalement différent du systême corporel, il seroit impossible que nous eussions des idées négatives, parceque rien ne peut affecter le systême corporel qu' une impression positive, et de simples négations ne pourroient pas engendrer de nouvelles idées. Toutes les idées donc dans ce cas seroient nécessairement positives; et rien ne prouve mieux l'existence réelle d'un principe libre et indépendant dans ses actions, que les idées négatives que forme ce principe par abstraction et par comparaison, deux sortes d'action qui lui sont particulières." P. 326.

The Cartesians, abhorrent from the idea that the lower animals should be immortal, had laboured to prove that their vital phenomena might be the effects of an organized structure, and therefore might naturally take the alarm at hearing of a vital principle within them independent of organism and material causes. Needham, therefore, in order to quiet their alarm, and to satisfy himself, has recourse to an argument employed by Lucretius, that this principle, supposing it a compound, may be dissolved, though its several particles, like those of matter, may be indestructible; and, if it were intended to operate only through corporeal organs, must cease to exist upon the destruction of the sensorium [b]. But here it may be asked, what is the sensorium? It cannot, conformably to a previous hypothesis, be any thing material, as the principle is supposed to be independent of material causes. Can it then be immaterial? Our author will not affirm that it is, nor will he assert that it is visible; for though generally supposed a part of the brain, yet that part has not been discovered by any anatomist. It is considerably more than a century, since Nuck, professor of anatomy in the university of Leyden, wrote his epitaph on the pineal gland, after proving that it could have no pretensions to be the sensorium[c]. Sir

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[b] "Mais si nous leur (aux Cartesiens) accordons un principe sensitif, quoique fort inférieur à la raison, ils nous demanderont peut-être ce que devient ce principe après la mort; ne seroit-il pas immortel comme notre ame? Point du tout. Il est indestructible comme les parties et les principes de la matiere, jusqu'à ce qu'il plaise à Dieu de les anéantir, mais non pas immortel. L'immortalité à leur égard, suppose une continuation de la vie sensitive, et cette vie un connoissance sensitive; mais une

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simple connoissance sensitive ne peut être supposée subsister après la mort et une totale destruction de *sensorium*." P. 375.

[c] VIATOR.
Gradum. Siste.
Omnique. Conatu. *Conarium.*
Respice. Sepultum.
Partem. Tui. Corporis. Primam.
Vt. Olim. Volebant.
Animæ. Sedem.
GLANDVLAM. PINEALEM.
Hoc. Seculo. Natam. Et. Extinctam.
Cujus. Majestatem. Splendoremque.
Fama. Firmarat.
Opinio, Conservarat.
Tamdiu. Vixit.
Donec. Divinæ. Particulæ. Aura.
Avolaverit. Tota.
Lymphaque. Limpida.
Locum. Suppleret.
Abi. Sine. *Glande.* Viator.
Lymphamque. Vt. Aliis. *Conario.* Concede.
Ne. tuam. Posteri.
Mirentur. Ignorantiam.

A. Nuck *Adenographia Curiosa et Uteri Foeminei Anatome Nova,* p. 153. Lugd. Bat. 1696, 8vo.

Everard Home has also demonstrated that several other parts of the brain have no better claim to any such privileges[d]. Nay, one of his reviewers has been induced, from numerous reports, to believe that the whole sensitive functions ascribed to the brain have, in various instances, been performed without it[e]; while Gall and Spurzheim, after assigning a variety of new faculties to the soul, have either seen, or fancied they have seen, amidst the numerous convolutions of the brain, the organs which have been appropriated to each. These differences of opinion are such as in general we might naturally expect to be warmly supported by special pleaders engaged on the opposite sides of a cause. In the character of judges, or in different circumstances, they might probably see their facts and their cases in a different light. At any rate, the vital principle, if it dies at all, dies not with the brain; for if absence be held as a proof of its extinction, so far from dying along with the brain it more generally dies before it. It is not only a well-known fact, but is attested by daily experience, by daily observation, and by accurate dissections, that the vital phenomena frequently cease when no anatomist can perceive any change in the structure of the brain, or in the structure of any other part of the whole system. Even the reviewer formerly quoted[f] admits that death does not imply so much a change in the visible organism, as some unknown change in the chemical affinities; an unknown change which interrupts circulation and nutrition, and resists the equable diffusion of caloric: in other words, the organism of the dead and the living body may for a while continue the same, though, from some invisible and unknown change in certain unknown chemical affinities, they exhibit very different phenomena.

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[d] See Observations on the Functions of the Brain in the *Philosophical Transactions* of 1814, and also Darwin's *Zoonomia*, vol. i. p. 9.

[e] "Although we have no doubt that the total destruction of the brain alone, the spinal cord and the nerves everywhere remaining entire, will in general be followed by partial or total insensibility, yet we think it has already been shown, that this is not always the consequence." *Edinburgh Review*, vol. xxiv. p. 451.—"So much with respect to the functions of the *brain* in sensation. With regard to that other part of the *central mass* of the nervous system, which is called the *spinal cord*, observation does not enable us to speak with such confidence. It is obvious, however, that in those cases in which the whole brain was found destroyed without loss of sensibility, parts must have enjoyed sensation which had no sort of nervous connection with the *spinal cord*. Such, for example, are the organs on which the olfactory, optic, pathetic, and auditory nerves are distributed. If, therefore, we find sensation independent of this prolongation in one case, it is most likely that it is so in every other." *Ibid.* p. 452.

Needham, however, on the other hand, though he sometimes speaks of a vital principle totally independent of all configuration and matter, yet he can scarcely divest himself of the opinion that organism is somehow related to life, and rather as a cause than as an effect; but upon finding that the visible organism is not calculated to support that opinion, rather than renounce it entirely, he is also sometimes inclined to suppose an invisible organism, to which, as being placed beyond the reach of all observation, he may ascribe, as well as the reviewer to his unknown chemical affinities, whatever properties he chooses to bestow on it.

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[f] See above, p. 115.

The number, the variety, and the inconsistency of our author's hypotheses, may be partly explained from that bias of his mind which inclined him to minute microscopic observations, and diminished his relish for more enlarged telescopic views. Ardent and impatient to draw conclusions with respect to the whole from a partial examination, he is under the necessity of changing his opinions with every successive change of phenomena. With a mind habituated to logical distinctions, he frequently mistakes the mere creatures of mental abstraction for agents in nature. The difficulty which he finds in reconciling his physical, metaphysical, and religious ideas, arises chiefly from his limited views. He sees clearly those objects which are near or of small extent, and which fall within the sphere of microscopic vision; but he cannot discern things at a distance, or of great magnitude, compare them together, or perceive the connection and general harmony which pervade the whole. From the same cause, although he dislikes the doctrines of materialism, he is not aware that much of his reasoning has a tendency to support them, and that his disavowal of these doctrines acquits only the intentions of his heart, but by no means the clearness of his understanding. If Haller has charged his writings with obscurity[g], it is certainly not without reason; for who can form an idea of a chain, of its strength and extent, from seeing only a few detached links, and these partly broken; or who can understand the geography of a country from a traveller, who surveys it only in the dark with the light of a candle, and who never sees more than a few square yards at a time? That Needham himself must have been conscious of this want of perspicuity, is abundantly evident from the number and extent of explanatory notes which he has subjoined to various passages that had been misinterpreted in his first edition; at all times, however, with a seemingly honest regard for religion and morals, and an earnest desire to discover the truth, if he any where happens to bewilder his readers, it is only in cases where he seems to have been equally bewildered himself.

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[g] "Turberville Needham ex Societate J. vir pius, dictione usus aliquantum obscura." *Bibliotheca Anatomica,* vol. ii. p. 362.

SECTION XII.

OPINIONS OF MAUPERTUIS.

Maupertuis, adopting with his cotemporaries, Buffon and Needham, the opinion of the ancients, that the seminal fluids of the male and female are extracts from all the parts of the body, agrees with them also in the opinion, that the particles of the extract are germs of the organs from which they are derived, and that the germs from similar organs being afterwards limited by chemical attraction, the body of the fœtus is thus organized, and would be organized were the organization a thousand times more difficult than it is[h]. After all, he concludes his *Vénus Physique*, the title of his treatise in which these opinions are contained, by expressing his doubts whether these particles of the seminal extract may not operate by instinct, or by a pre-established order of harmony; whether this instinct may not be diffused through the whole mass, as in a republic, or be confined to a single individual, as in a monarchy; whether this particle may not retain its essence unaltered in a separate state floating in the air, concealed in water, in the leaf of a plant, or the flesh of an animal: and whether in again forming a body, it may not be restricted to the same species; or whether, by entering into new combinations, it may not be capable of producing all the diversities of species[i].

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[h] "La chymie en a depuis reconnu la nécessité; et les chymistes les plus fameux aujourd'hui admettent l'attraction, et l'étendent plus loin que n'ont fait les astronomes.

"Pourquoi si cette force existe dans la Nature, n'auroit-elle pas lieu dans la formation du corps des animaux? Qu'il y ait dans chacune des semences des parties destinées à former le cœur, la tête, les entrailles, les bras, les jambes; et que ces parties ayent chacune un plus grand rapport d'union avec celle qui, pour la formation de l'animal, doit être sa voisine, qu'avec toute autre; le fœtus se formera: et fût-il encore mille fois plus organisé qu'il n'est, il se formeroit." *Œuvres* de Maupertuis, tom. ii. p. 89. Lyon, 1768, 4 tom. 8vo.

[i] "Si la volonté n'est pas la vraie cause de ces mouvemens, mais simplement une cause occasionnelle, ne pourroit-on pas penser que l'instinct seroit une cause semblable des mouvemens et des unions des petites parties de la matière? ou qu'en vertu de quelqu'harmonie préétablie, ces mouvemens seroient toujours d'accord avec les volontés?

In his treatise entitled *Systême de la Nature*, beginning to think that chemical attractions might not be sufficient to organize the seminal extract, he adopts the hypothesis that in addition to its chemical attractions, each particle or germ is also endowed with a species of intelligence, a degree of memory, desire, and aversion; and that by these as it were by instinct they are made to resume particular situations corresponding to those which they had occupied[k]. This small treatise

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"Cet instinct, comme l'esprit d'une république, est-il répandu dans toutes les parties qui doivent former le corps? ou, comme dans un etat monarchique, n'appartient-il qu'à quelque partie indivisible?

"Dans ce cas, cette partie ne seroit-elle pas ce qui constitue proprement l'essence de l'animal, pendant que les autres ne seroient que des enveloppes, ou des especes de vêtemens?

"A la mort cette partie ne survivroit-elle pas? et dégagée de toutes les autres, ne conserveroit-elle pas inaltérablement son essence? toujours prête à produire un animal, ou, pour mieux dire, à reparoître revêtue d'un nouveau corps; après avoir été dissipée dans l'air, ou dans l'eau, cachée dans les feuilles des plantes, ou dans la chair des animaux, se retrouveroit-elle dans la semence de l'animal qu'elle devroit reproduire?

"Cette partie ne pourroit-elle jamais reproduire qu'un animal de la même espece? ou ne pourroit-elle point produire toutes les especes possibles, par la seule diversité des combinaisons des parties auxquelles elle s'uniroit?" Tom. ii. p. 132.

[k] "Une attraction uniforme et aveugle, répandue dans toutes les parties de la matiere, ne sauroit servir à expliquer comment ces parties s'arrangent pour former le corps dont l'organisation est la plus simple. Si toutes ont la même tendance, la même force pour s'unir les unes aux autres, pourquoi celles-ci vont-elle former l'œil, pourquoi celles-là l'oreille? pourquoi ce merveilleux arrangement? et pourquoi ne s'unissent-elles pas toutes

appeared first in Latin, at Erlang, in 1751, under the fictitious name of Dr. Baumann, and being in the form of a thesis, was at that time entitled *Dissertatio Inauguralis Metaphysica de Universali Naturæ Systemate.* The real author, however, was suspected, and, from the manner in which it was afterwards attacked by Diderot, was induced to acknowledge it. Diderot, who bestows the highest eulogiums upon the thesis, affects to be alarmed at the terrible consequences which might be deduced from it[1], particularly from the passage where, upon the supposition that each particle of matter is endowed with a portion of intelligence or perception, Maupertuis adds, it is probable that from all the perceptions of the different particles composing our bodies, there results a perception much more powerful and much more perfect than any of the elementary perceptions; in short, a perception which bears to a simple elemen-

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pêle-mêle? Si l'on veut dire sur cela quelque chose qu'on conçoive, quoiqu'encore on ne le conçoive que sur quelque analogie, il faut avoir recours à quelque principe d'intelligence, à quelque chose de semblable à ce que nous appellons *desir, aversion, mémoire.*" Tom. ii. p. 146.

"Les élémens propres à former le fœtus nagent dans les semences des animaux pere et mere: mais chacun extrait de la partie semblable à celle qu'il doit former, conserve une espece de souvenir de son ancienne situation; et l'ira reprendre toutes les fois qu'il le pourra, pour former dans le fœtus la même partie." Tom. ii. p. 158.

[1] "M. Diderot après avoir loué excessivement la these d'Erlangen, prétend qu'on en peut tirer de terribles conséquences." Tom. ii. p. 197.

tary perception, the same relation that an organised body bears to a simple elementary particle. Each particle being thus united to others, and confounding its own perception with theirs by losing the perception or consciousness of itself as an individual, the recollection of the primary state of these elements, says Maupertuis, must fail us; and we must therefore despair of tracing the progress of our organization to its commencement.

Besides, when we talk of several elementary perceptions uniting to form an aggregate perception, we must not, says Maupertuis, suppose that each part of that elementary assemblage of particles forming our bodies, contributes equally and uniformly to the aggregate perception. Experience here informs us of the greatest differences, whether these differences be owing to different original perceptions in the elements themselves, or to differences of arrangement in the different assemblages in which they are collected. One part of our body appears to contain the assemblage of the elements whose united perceptions produce thought; other parts to contain only those assemblages of elements which are destined to sensation; while in others again, there appears not any union of elementary perceptions which can cause perception with regard to us [m]. Such are the hypotheses from which Diderot deduces his alarming consequences; but instead of objecting to these consequences as they are opposed to the faith of the church, of which Diderot pretends to be an advocate, I would rather object to the very name and erroneous views on which the hypotheses themselves are founded. No person in the least acquainted with the animal structure, if a man of reflection, can entertain the idea for a moment, that the similar particles in the seminal extract mutually combine by chemical attraction. Were that the case, the osseous particles should all unite into one bone, the carneous particles into one muscle, the tendinous particles into one tendon; the particles forming the coats of the arteries into one artery; those forming the coats of the veins into one vein; and those forming the coats of

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[m] " Il semble que de toutes les perceptions des élémens rassemblées il en résulte une perception unique, beaucoup plus forte, beaucoup plus parfaite, qu'aucune des perceptions élémentaires, et qui est peut-être à chacune de ces perceptions dans le même rapport que le corps organisé est à l'élément. Chaque élément, dans son union avec les autres, ayant confondu

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sa perception avec les leurs, et perdu le sentiment particulier du *soi*, le souvenir de l'état primitif des élémens nous manque, et notre origine doit être entiérement perdue pour nous.

" Au reste, lorsque nous parlons de cette réunion des perceptions des élémens dans une perception unique, il ne faut pas croire que chaque partie de l'assemblage d'élémens qui forme notre corps contribue également et uniformément à cette perception: l'expérience nous fait voir ici des différences extrêmes, soit que les élémens soient originairement doués de perceptions de différens genres, soit que leur différente disposition, dans leurs différens assemblages, produise ces différences. Quelque partie de notre corps semble contenir l'assemblage des élémens dont les perceptions font la pensée; les autres parties ne paroissent renfermer que des assemblages d'élémens destinés à la sensation; dans d'autres enfin il ne paroît aucune réunion de perceptions élémentaires qui puisse former *pour nous* aucun genre de perception." Tom. ii. p. 172.

lymphatics into one lymphatic; instead of two eyes, two ears, two hands, and two feet, we should have but one of each kind; all our sensations would be confined to a single nerve; and that without any ramifications, unless attracted by dissimilar parts, which would be contrary to the hypothesis. Now what is the fact? There is not a visible part of the body, be it osseous, muscular, tendinous, glandular, cartilaginous, or membranous, which is not combined with a variety of dissimilar parts, such as veins, arteries, nerves, absorbents, and cellular substance, and each of these specific in function, form, magnitude, position, structure, number, and proportion.

Take the other hypothesis, that each particle of the seminal extract is a germ of the organ from which it is derived; each germ, upon this hypothesis, must contain a variety of other germs; suppose, for example, the germ of an atlantal extremity, it must contain a great variety of dissimilar germs, the germs of bones, cartilages, ligaments, muscles, nerves, arteries, veins, and lymphatics, definite in form, position, connection, number, and proportion. Is there on record a single instance of compound bodies of such a description, united by chemical attraction, or separated by chemical repulsion? Besides, the arm is not joined to the body by juxta-position; it is evidently not a whole but a part, and a part too which cannot be detached without the division of a great many organs, namely, the brachial artery, and the brachial vein, their accompanying lymphatics, and the whole axillary plexus of nerves, the trapezius muscle, the levator scapulæ, the two rhomboidei, the serrati antici, superior and inferior, the pectoralis major, the latissimus dorsi, the omohyoideus, and if the clavicle is to be included, the cleido-mastoideus, and the subclavius. All these organs belong as much to the trunk as to the arm, and therefore only a part of their germs can be connected with the embryo arm in the seminal extract: to unite them again with the parts of the trunk, from which they were separated, will certainly require something more than the chemical attractions with which we are acquainted; and something more than that imperfect degree of intelligence, perception, memory, desire, and aversion, which Maupertuis has assigned to them. If any thing unites them, on this hypothesis, it must certainly be the united intelligence of all the particles, concentrated in a focus, and combining with the concentrated intelligence of all the particles, constituting the parts from which they were separated; the elementary particles, as has been asserted, being divested of all their own peculiar perceptions, as soon as they enter into union with others. But, a full grown arm, if once separated, is never observed to unite again with a full grown trunk, although its intelligence, from the millions of additional elementary perceptions, should certainly be greater than that of its germ in the seminal extract; and yet, how does it happen that the seminal germ, with its very imperfect degree of intelligence, can produce that union which the full grown arm, with a much higher degree of intelligence, cannot accomplish? If the less degree of intelligence be here preferable to the greater, it is probable that no intelligence at all would be preferable to both. It is certain, that the architect would require unlimited degrees of skill, as well as of power, who should be able to construct a regular and permanent building, had every particle composing the metals, the stones, and the timbers, a will of its own; and were the perceptions, desires, and aversions of every such particle either to be subdued or indulged, before it would consent either to occupy or remain in the place which he might choose to assign to it.

But, granting that the particles themselves are the architects, and that they are more unanimous in their councils than an equally numerous assemblage of men has ever been, Maupertuis does not appear to have foreseen that much more is required of their intelligence than merely to construct the rudiments of a fœtus. They have also to regulate the period of gestation; to fix the time of birth; to dismiss the umbilical cord and placenta; to shut up the foramen ovale, the ductus venosus, and the ductus arteriosus; to commence a new mode of circulation; to bring the organs of digestion into action; to instruct them how to select food, and how to prepare it; to teach the lacteals how to absorb it, and the arteries how they are to distribute it; to select with accuracy the species of particles which are suited to each species of organ; to allot with precision the requisite proportions, in order that the symmetry of the system may be preserved; to watch over the parts which are decayed; to separate and discharge them at the proper time; to supply the waste; to modify not only the form but the structure at stated periods; to change even the desires and aversions; to know when to stop the increase of growth, and when to select from the different organs the germs or particles which are fitted to form a seminal extract.

That to plan and execute these operations is not entrusted to the aggregate intelligence resulting from the elementary perceptions, is obvious from the fact, that all the philosophers who have hitherto appeared, though equal in number to the particles or germs of a seminal extract, have never, with all their united endeavours and united intelligence, (notwithstanding each intelligence, according to the hypothesis, is supposed equivalent to millions of elementary perceptions,) been able to produce any thing resembling an organized substance either animal or vegetable. The inference then is, that if the particles of the seminal extract construct the system, they do not communicate, as Maupertuis supposes, the whole of their perceptions to the aggregate intelligence, but reserve to themselves in unfathomable mystery, the whole secret of organization; and even when constructing their devoted admirers, the hylozoic and chemical physiologists, communicate as little of the secret to them as to a frog, a fish, or an oyster. If, therefore, such physiologists be convinced that their own bodies have been organized by the seminal extract, and by the assimilated particles of food, and that it is to them that they owe their instincts, their genius, their philosophy, they are certainly not deficient in credulity, whatever they may be in reasoning, experiments, and observation. To believe that they eat, or that they have been eating the beings which made them; they believe what Cicero could not conceive to have fallen within the compass of insanity[n]. Maupertuis, aware of the seeming absurdity of his hypothesis, endeavours to vindicate it by that of Descartes. Thus taking the hypothesis of Descartes for granted, that the lower animals are merely organized masses of matter; is it not, he observes, as absurd to ascribe desire, aversion, and memory to them, as to the particles of which they are composed[o]? The answer to this question must be in the negative, for whether live animals be mere masses of matter or not, our senses compel us to allow them desires, aversions, and memories; but what sense, or what process of reasoning has ever informed us, that the atoms of which their bodies are composed, possess such powers, or have ever organized any regular structure in either the animal or vegetable kingdom. Descartes's hypothesis affords no support to that of hylozoism; it implies, indeed, that the motions, the passions, and the instincts of animals, are the consequences of mechanism, but of a mechanism which is not traced either to the particles in the seminal extract, or to the assimilated particles of the food, but to much more adequate causes, to the wisdom and power of the author of nature.

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[n] "Cum fruges *Cererem*, vinum *Liberum* dicimus, genere nos quidem sermonis utimur usitato; sed ecquem tam amentem esse putas, qui illud, quo vescatur credat Deum esse?" *De Nat. Deor.* lib. iii. § xvi.

[o] "Si dans de gros amas de matiere, tels que sont les corps des animaux, l'on admet sans péril quelque principe d'intelligence, quel péril plus grand trouvera-t-on à l'attribuer aux plus petites parties de la matiere ?- - -Le péril, s'il existoit, seroit aussi grand à l'admettre dans le corps d'un éléphant ou d'un singe, qu'à l'admettre dans un grain de sable." Tom. ii. p. 149.

Although unblemished candour, a vigorous understanding, and a deep sense of moral propriety, have fallen to the lot of only a few, yet that man must have seen little, and reflected less, who has not perceived that much of our creeds respecting philosophy, religion, and politics, is more frequently the effect of circumstance, habit, inclination, interest, and feeling, than of cool reasoning and dispassionate inquiry. Accordingly we find that the capacity for learning an art or a science is much more common than that of applying it to useful purposes; that many men have become learned who never could arrive at prudence and discretion; and that many have been ranked, on account of their talents, among philosophers, who, had they been estimated according to their wisdom, would have ranked very low in another scale of a different description. Of those possessed of learning and talents without wisdom, there are many who, aspiring to the reputation of being philosophers, conceive it a duty incumbent upon them to express their distrust of every thing under the semblance of religion, but to listen with attention to every opinion, however absurd, that comes recommended in the name of philosophy. Thus, the Marquis D'Argens, would have gladly adopted many opinions of Ocellus Lucanus, had he not found it convenient to profess what he did not believe,—the doctrines of the church [p]; a species of conduct which in a priest would be highly reprobated as the vilest hypocrisy, but which in a philosopher, it would seem, is to be considered only as a proof of political wisdom. Thus also Lord Kames, one of the most credulous of human beings in matters of philosophy, while collecting arguments against Revelation, for which he professes the highest regard, would it seems have believed, had revelation but sanctioned his opinion, that the Giagas, a nation of Africa, had sprung from a species totally distinct from the rest of mankind, because they buried all their own children the moment of birth, and chose in their stead the most promising children taken in war [q]; a

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[p] See above, p. 42.

[q] His lordship, after a variety of arguments to show that mankind have sprung from a number of original pairs, seems to think his opinion triumphantly supported by these practices of the Giagas. The story, as he tells it, is, that "The Giagas, a fierce and wandering nation in the heart of Africa, are in effect land pirates, at war with all the world. They indulge in polygamy; but bury all their children the moment of birth, and choose in their stead the most promising children taken in war. There is no principle among animals more prevalent than affection to offspring: supposing the Giagas to be born without hands or without feet, would they be more distinguishable from the rest of mankind?"

From that singular credulity, with which his lordship appears mode of reasoning so very different from any to which men have hitherto been accustomed, that if we adopt his lordship's principles, we are bound to conclude that he had sprung from no stock at all, but was the first of a new genus. Maupertuis, who disdains making any attempt to reconcile his hypothesis with the faith which he professed, maintains, in repelling the objections of Diderot, that religion and philosophy can never interfere; that in the general arrangements of science they belong to quite different orders; rest upon different species of evidence; and that if there be any chain

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to grasp at every idle tale that favours his hypothesis, it is surprising that he ever entertained any suspicions of the truth of these reports concerning the Giagas; and yet in a note he frankly acknowledges that he had had his doubts even oftener than once. "I have oftener," he says, "than once doubted whether the authors deserve credit from whom this account is taken; and, after all, I do not press it upon my readers. There is only one consideration that can bring it within the verge of probability, viz. the little affection that male savages have for their new-born children, which appears from the ancient practice of exposing them. The affection of the mother commences with the birth of the child; and, had she a vote, no infant would ever be destroyed. But as the affection of the father begins much later, the practice of destroying new-born infants may be thought not altogether incredible in a wandering nation, who live by rapine, and who can provide themselves with children more easily than by the tedious and precarious method of rearing them."--- "But this opinion, (that mankind have sprung from a number of original pairs) however plausible," observes his lordship, "we are not permitted to adopt, being taught a different lesson by Revelation, namely, that God created but a single pair of the human species."—*Sketches of the History of Man*, vol. i. p. 35, 41, edit. Glasg. 1819, 3 vols. 12mo.

of connection subsisting between them, it is a chain which is known only to the supreme being, and utterly beyond our comprehension[r]. But what he means here by religion, and what by philosophy, is

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[r] " Voyons maintenant quel effet la méthode de M. Diderot doit produire sur les différens esprits.

" 1°. Il en est que des conséquences opposées aux dogmes théologiques n'alarmeront point; qui ne croiront point que l'impossibilité d'accorder la Philosophie avec la révélation doive faire rejeter une hypothese qui d'ailleurs s'accorde bien avec la Nature. Pour ceux là il est évident que les objections de M. Diderot sont sans force.

" 2°. Il en est d'autres qui ne regarderont point les conséquences fâcheuses qu'on peut tirer d'une hypothese comme des preuves décisives contre. Ils penseront, ou que ces conséquences ne sont pas des suites nécessaires de l'hypothese, ou qu'elles ne sont point en effet contradictoires à ce que nous devons croire: que la Religion et la Philosophie ont des districts si différens, que nous ne pouvons passer de l'une à l'autre: que l'être suprême voit la chaîne qui les unit, mais que cette chaîne est au dessus de notre portée. Ceux qui pensent ainsi ne seront que médiocrement ébranlés par les objections de M. Diderot; et pour les rassurer, il ne seroit pas nécessaire de faire aucune autre réponse que ce que nous disons ici.

" 3°. Pour le petit nombre de ceux que tout alarme, qui dès qu'une proposition philosophique leur est présentée, vont la porter au temple pour en juger à la lueur de la lampe; ce sont apparemment ceux-là que l'auteur de l'interprétation de la Nature a eu en vue, c'est à eux que ses objections paroissent adressées." P. 200.

" M. Diderot n'a peut-être pas rendu justice à notre ouvrage, mais il a rendu justice à nos sentimens, lorsqu'il a dit: " Il faut lire son ouvrage pour apprendre à concilier les idées philosophiques les plus hardies avec le plus profond respect pour la Religion." En effet nous sommes si remplis de ce respect, que nous n'hésiterions jamais à lui sacrifier notre hypothese, et mille hypotheses semblables, si l'on nous faisoit voir qu'elles continssent rien qui fût opposé aux vérités de la foi, ou si cette autorité à

not clearly understood; for, if the theologist should always have a reason for the hope that is in him, genuine religion and genuine philosophy should rest on the same species of evidence, on sound reasoning, accurate observation, and rational induction; on such an evidence as that on which Socrates, Cicero, Plato, and many of the ancients were led to entertain a belief of a deity and a future state, or on such an evidence as the more intelligent of the christian world believe in the divine authority of the scriptures. But many superstitions which pass under the name of religion, have, from want of such evidence, no title to rank with religion; and many foolish reveries, which pass under the name of philosophy, have, from want of such evidence, no title to rank with philosophy. Thus many superstitions, which pass under the name of religion, require our assent to the truth of extravagant legendary tales concerning miracles, which, owing to the tricks of their juggling priests, were believed to be performed by blocks of stone, of wood, or of metal, representing the figures of their tutelary saints; while the reveries of Maupertuis, and such as his, which pass under the name of philosophy, make a still more unconscionable demand upon our credulity. They require us to believe, that such particles of matter as compose

laquelle tout Chrétien doit être soumis les desapprouvoit. Mais nous regarderions comme un outrage fait à la Religion, si l'on pensoit que quelque conjecture philosophique, qu'on ne propose qu'en chancelant, fût capable de porter préjudice à des vérites d'un autre ordre et d'une tout autre certitude." P. 216.

our food, and are afterwards assimilated by the processes of digestion, though apparently as stupid as any block of wood or of stone, and infinitely more stupid than any priest who supports the credit of any superstition, are, notwithstanding, the sources of all wisdom and intelligence; that they are those eternal beings which have arranged the system of the universe, and organized the structures of all the species of plants and animals; which have made philosophers, and instilled into many the strongest desire of becoming their apostles, and preaching the miracles which they have performed, and which, if performed by such very insignificant particles, are of all miracles decidedly the greatest that have ever been presented to the notice and acceptance of human credulity in its most degraded state of superstition.

SECTION XIII.

OPINIONS OF J. B. ROBINET.

Lucretius had observed, that Tellus, or the Earth, in her attempts to produce animals, had produced only incongruous monsters, and that nature was at last obliged to interfere, to destroy generations of her productions[s], and construct animals on specific plans, that they might be capable of continuing their species by certain determinate modes of propagation. His master Epicurus was led to believe that nature herself had learned this art from experience and necessity[t].

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[s] See above, p. 48.

This last hypothesis, although with a singular modification, is what Robinet has endeavoured to support by additional arguments[u]. From observing that several species of minerals and plants resemble in their form particular organs of the human body; and that the species of the animal kingdom, from the zoophyte upwards, make nearer and nearer approaches to man in form and in structure, he supposes that nature, from the commencement of her operations, was solely intent upon making man; and that the regularly definite forms of minerals, plants, and the lower animals, are nothing more than the casual results of her experiments, while she was aiming at the accomplishment of what he denominates her *chef-d'œuvre;* the formation of man, from first to last, being invariably the ultimate object of her ambition. What nature itself is he has not informed us; but so far as can be learned from his observations and modes of reasoning, it seems to be a certain tendency of matter to be organized, and to assume the human structure and form; in short, something which, like man, reasons and reflects, collects observations, and makes experiments, to improve itself in the arts and sciences. His second chapter commences with the following singular assertions: "All matter is organic, living and animal; matter inorganic, dead or inanimate, is a chimera, an impossibility; to be nourished, developed, reproduced, are the general effects of its inherent, vital, animal activity; and we are entitled to admit these propositions as established data[v]." He observes that when we reflect deeply upon the secret operations of nature, an important doubt arises in the mind, whether that which constitutes the substance of beings be matter or activity[x]. In certain cases, he says, the active power appears to have its residence in matter, and to be one of its essential qualities; in others again it appears to be the substance, and the matter nothing more than the instrument, through the medium of which it displays its energies [y]. In the inferior orders of beings, such as minerals and vegetables, we ascribe he says, all their phenomena to matter, as their principal cause, without suspecting that these may contain within them something of a very different nature from that which is usually styled material [z]. Ascending higher in the scale of being, we begin to doubt, and to be indecisive respecting the title by which matter lays claim to such phenomena. We observe a spontaneity of movements and of operations, displaying certain active principles to which we are compelled to ascribe them. At the same time we perceive this principle carried along, and so irresistibly controlled by matter, that in such systems the matter and activity seem to predominate as it were by turns, and to be successively the principal and the accessory according to circumstances. We might almost say, that in such cases the active principle is exerting its energies to rise superior to the solid, impenetrable, extended mass to which it is chained, and to whose yoke it often must submit [a].

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[t] *Αλλα μην ὑποληπτεον και την φυσιν πολλα και παντοια, υπο των αυτων πραγματων διδαχθηναι τε και αναγκασθηναι.* *Gassendi,* vol. i. p. 54. Wetstein's edition of Diogenes Laertius has *την των ανθρωπων φυσιν,* an expression which, instead of implying any opinion peculiar to Epicurus, absurdly intimates a fact which is known to all mankind, namely, that man is instructed by experience, though not indeed to such an extent as Epicurus and Hume would have us to believe.

[u] These arguments are contained in his work entitled *Considerations Philosophiques de la Gradation Naturelle des Formes de l'Etre, ou les Essais de la Nature qui apprend a faire l'Homme.* Paris, 1768, 8vo.

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[v] "Toute la matière est organique, vivante, animale. Une matière inorganique, morte, inanimée, est une chimère, une impossibilité.

"Se nourrir, se développer, se reproduire, sont les effets généraux de l'activité vitale ou animale inhérente à la matière.

"Nous croyons avoir quelque droit d'admettre ces propositions pour des données." *Considerations Philosophiques,* p. 8.

[x] "Quand on médite profondément sur les opérations secretes de le nature, il s'éleve un doute important qui embarrasse l'esprit, savoir, si, dans les êtres, le sujet est la matière ou l'activité." P. 8.

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[y] "A certains égards, la puissance active paroît résider dans la matière, et en être une qualité essentielle, tandis que d'un autre côté l'activité semble être la substance, et la matière seulement un instrument dont cette substance se sert pour déployer son énergie." P. 8.

[z] "Dans les etres inférieurs, tels que les minéraux et les végétaux, on rapporte tous les phénomènes à la matière comme au fond principal de ces etres : on ne supçonne pas même qu'il puisse y avoir en eux autre chose que le sujet matériel." P. 8.

[a] "Un peu plus haut, on commence à douter: on est indécis. On remarque une spontanéité de mouvemens et d'opérations

In man, on the contrary, says Robinet, it is evident that matter is only the organ by which the active power displays its faculties, the mere envelope which modifies its actions, without which it might probably act with more freedom, without which it might perhaps be incapable of acting at all, and without which most assuredly it could not render its operations the objects of our senses. Nay, seems it not probable, adds he, that the more this power increases in vigour and approaches to perfection, the more it rises superior to the matter in which it resides? Nay, is it not possible that it may in time naturally arrive at such a degree of perfection as to become absolutely independent of material organs, to throw them off as useless incumbrances, and be ready to pass into the world of pure intelligences[b]?

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qui décélent un principe actif, auquel on ne peut s'empêcher de les attribuer. Cependant on voit encore cette activité entrainée et déterminée invinciblement par la matière: desorte que dans de tels systêmes, la matière et l'activité paroissent dominer tour-à-tour, être successivement le principal et l'accessoire, selon les circonstances. On diroit que la puissance active fait des efforts pour s'élever au dessus de la masse étendue, solide, impénétrable, à laquelle elle est enchaînée, mais qu'elle est souvent obligée d'en subir le joug." P. 9.

[b] "Dans l'homme, au contraire, il est évident que la matière n'est que l'organe par lequel le principe actif deploie ses facultés. C'est une enveloppe qui modifie son action, sans laquelle peut-être il agiroit plus librement, sans laquelle aussi peut-être il ne sauroit agir, et sans laquelle surement il ne rendroit pas ses opérations sensibles.

"Ne semble-t-il pas encore que plus la puissance active croît et se perfectionne dans l'etre, plus elle s'éleve au dessus de la

Such, agreeably to this hypothesis, he says, should be the progress of the active force inherent in matter. At first it would constitute only the least portion of the being to which it belongs, but by multiplied efforts and progressive developments, would gradually become the principal part, and afterwards, if such an expression were allowed, would *dematerialize* itself so entirely, that, in its last act of metamorphosis, it would actually be transformed into a pure intelligence [c].

Whatever others may think of this hypothesis, which its author is willing to leave to its fate, he himself is strongly inclined to believe, that the force of which he speaks is the most universal and the most essential attribute of being, or rather its very essence; and repeats his conviction, that what is material is nothing more than the organ or medium by which it manifests its operations [d].

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matière? Ne pourroit elle point parvenir naturellement à un tel degré de perfection, qu'elle n'eût plus absolument aucun besoin de l'organe matériel pour opérer, desorte qu'alors elle le rejetteroit comme un instrument inutile, pour passer dans le monde des intelligences pures?" P. 9.

[c] "Telle seroit, suivant cette hypothese, la progression de la force active inhérente à la matière. Elle ne feroit d'abord que la moindre portion de l'être. Par des efforts multipliés et des développemens progressifs, elle parviendroit à en faire la principale partie. Enfin elle se dématérialiseroit entiérement, si j'ose ainsi m'exprimer, et pour dernière métamorphose elle se transformeroit en une pure intelligence." P. 9.

[d] "Quoi qu'on puisse penser de cette conjecture hardie que je donne pour ce qu'elle peut être, je serois assez porté à croire que cette force dont je parle est l'attribut le plus essentiel, le plus

Accustomed, he says, to judge of realities from the appearances which strike our senses, we reluctantly admit the existence of any thing in the world which is not material, because we can see nothing but matter: and, to borrow the language of a modern author, as all the modifications of nature, which are objects of sense, consist entirely in the variation of the limits of extension, as soon as we are forced to abjure extension, we fancy ourselves on the confines of nonentity; and, startled at the thought, suddenly stop short, as if we had reached the limits of existence. In this situation, we do not consider that the material or visible world is nothing but an assemblage of phenomena, and that there must also be necessarily some invisible world, the foundation or substratum of that which is visible, and to which we must ascribe whatever is real or substantial in nature. *This invisible world is the collection of all the forces which tend incessantly to ameliorate their existence*, which they ameliorate by constantly extending and bringing towards a state of perfection their several energies in that proportion which is suitable to each of them[e].

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universel, disons mieux, le fond de l'être, et que le matériel est l'organe ou le moyen par lequel cette force manifeste ses opérations." P. 9.

[e] "Accoûtumés à juger de la réalité des choses par les apparences qui frappent nos sens, nous ne voulons admettre dans le monde que de la matière, parce que nous ne voyons que de la matière. Et, pour emprunter les paroles d'un auteur moderne, comme toutes les modifications, que nos sens observent dans

From this last passage we come to understand, that instead of one species of force, activity, or principle, there is a great number of species; that these species are collected into groups, and that these groups, although they differ in their mode of combination, in the number, proportion, order, and form of their organs, are in other respects exactly the same, the same in a stone, in a plant, and in a man[f]; nay, what is more, that these groups, however different in their mode of combination, in the number, proportion, order, and form of their organs, have all invariably the same tendency, that is, a tendency to increase their energies, and to make

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la nature, consistent dans la simple variation des limites de l'étendue, dès qu'il faut abjurer cette étendue, on croit rentrer dans le néant, on s'arrête, comme s'il ne pouvoit y avoir rien au-dela.

“ Nous ne faisons pas attention que le monde matériel ou visible est un assemblage de phenomènes, et rien autre chose; qu'il doit nécessairement y avoir un monde invisible qui soit le fondement, le sujet du monde visible, et auquel on doive ramener tout ce qu'il y a de réel et de substantiel dans la nature.

“ Ce monde invisible est la collection de toutes les forces qui tendent continuellement à améliorer leur existence, qui l'améliorent en effet, en étendant et perfectionnant sans cesse leur action, selon la proportion convenable à chacune d'elles.”—P. 10.

[f] “ On trouve dans la pierre et dans la plante, les mêmes principes essentiels à la vie, que dans la machine humaine: toute la différence consiste dans la combinaison de ces principes, le nombre, la proportion, l'ordre, et la forme des organes.”—P. 7.

man. In the mineral kingdom, where their energies are only imperfectly developed, they produce forms resembling single organs of the human body, as the brain, the heart, the eye, the ear, the foot, and the hand [g]. The same, in ascending to the vegetable kingdom, exhibit the functions of nutrition, growth, and the power of reproduction, and upon arriving at the animal kingdom they proceed from zoophytes through all the gradations of the lower animals, till they come to man; the ultimate object of all these tendencies. In this progress, Robinet fancies that he sees nature in labour, groping her way through all the prodigiously diversified series of forms and structures, making experiments, collecting observations, and serving a long and tedious apprenticeship, in learning the art how to make man [h].

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[g] The author here alludes to those minerals, which by some have been fancifully termed Encephalites, Lithocardites, Opthalmolites, Olites, Podolites, and Chirites, from some distant and fantastic resemblance in external form, to those parts of the animal structure after which they are named.

[h] " Dans la suite prodigieusement variée des animaux inférieurs à l'homme, je vois la nature en travail avancer en tâtonnant vers cet etre excellent qui couronne son œuvre.

" A la tête de cette grande échelle des habitans de la terre, paroit l'homme, le plus parfait de tous : il réunit, non pas toutes les qualités des autres, mais tout ce qu'elles ont de compatible en une même essence, élevé à un plus haut degré de perfection. C'est le chef-d'œuvre de la nature, que la progression graduelle des êtres devoit avoir pour dernier terme; au moins nous le prenons ici pour le dernier, parce que c'est à lui que se termine notre échelle naturelle des êtres.

But the art being learned, how does it happen that she still continues to work as an apprentice? We can easily conceive, that a being of the character which is here ascribed to her, might, in a number of her earlier attempts, have produced monsters, and that these monsters, although they fell short of her expectations, might have been the means of correcting many previous mistakes, of acquiring dexterity in operation, of suggesting new and important ideas, and of thus facilitating the attainment of her object. But the object attained, what further use for any experiments? what pretence either for ignorance or want of dexterity? There is no scale of being, on the general hypothesis; the constant tendency of all matter is to make man and man only; there are no vacancies therefore to be filled; or were there a scale, and vacancies to be filled, how could they in a regular manner be filled up by monsters, which were not to propagate or to live beyond the short period of an ordinary generation[i]? Further, it may be asked, what occa-

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"Sous ce point de vue, je me figure chaque variation de l'enveloppe du prototype, comme une étude de la forme humaine que la nature méditoit; et je crois pouvoir appeller la collection de ces études, *l'apprentissage de la nature,* ou les essais de la nature qui apprend à faire l'homme." P. 3, 4.

[i] "Croyons que les formes les plus bizarres en apparence, à quelque degré qu'elles le soient, appartiennent nécessairement et essentiellement au plan universel de l'être; que ce sont des métamorphoses du prototype aussi naturelles que les autres, quoiqu'elles nous offrent des phénomènes différens; qu'elles servent de passage aux formes voisines; qu'elles préparent et amenent les combinaisons qui les suivent, comme elles sont amenées par celles qui les précédent; qu'elles contribuent à l'ordre des choses, loin

sion had nature for studying the art how to make man, when by the hypothesis there was in all matter, from the very beginning, an universal and invariable tendency to form such a being, and that tendency not the consequence of accident or design, but original, inherent, essential to its character and existence? Admitting this branch of the hypothesis, is it not surprising that all matter has not long ago, without any assistance from nature, been reduced to the human structure and form? or, admitting the other, that all matter is daily becoming less gross, less massive, and less material, while its forces, on the contrary, are in every respect growing more and more active[k], is it not also equally surprising that the whole mass, during an innumerable series of ages, has not been *dematerialized* and metamorphosed into pure intelligence?

Yet these are not the only hypotheses of Robinet. He supposes that man is the model or prototype of all organisms, and calls this prototype

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de troubler. Ce n'est peut-être qu' à force d'êtres que la nature parvient à produire des êtres plus réguliers, et d'une organisation plus symmétrique. Qui nous répondra qu'au commencement il n'y a pas eu beaucoup plus de ces produits monstrueux, que de formes plus régulièrement organisées? Si c'est le contraire aujourd'hui, c'est que ces monstres manquent des facultés nécessaires pour se reproduire, la faculté générative étant attachée à une certaine combinaison d'organes plus régulieres, ils ont du périr, et laisser la place aux etres mieux organisés." P. 198.

[k] " A chaque terme la matière se dégrossit, et devient moins massive, moins matérielle en quelque sorte, au lieu que la force devient de plus en plus active en tous sens." P. 11.

an intellectual principle[1]: by which language, if he means any thing, he must mean a substance, perceptible only by the understanding, like an ἰδέα of Plato, and suppose that such a substance or species of substance gives form to matter; or he must mean what we sometimes express by the English word *idea*, a mental prototype, not properly a substance, but a plan or model conceived by the mind, agreeably to which nature constructs a material organism; or, to adopt the language of Robinet, realizes the prototype by exhibiting it under a sensible form. Upon this hypothesis the visible world is only a type of what is invisible, and nature, instead of being a blind tendency of matter, must be a principle of active intelligence. Besides, as the prototype on this hypothesis remains unaltered, and contains exemplars of all the various species of forms in the animal, mineral, and vegetable kingdoms, the mere conversion of these exemplars into material or sensible forms, could not possibly furnish her with new ideas, the sensible forms being only the types of the unchanged and invisible prototypes which had been previously existing in the mind. Further, if man was the only prototype, if that prototype contained exemplars of all other organisms, and if these exemplars were first conceived in relative position, connection, number, magnitude, and proportion, it should follow, that nature first realized her idea of man as a perfect whole, and then constructed animals and plants, and mineral bodies, in imitation of the several exemplars of which her mental prototype was composed. Nay, this is the view which Robinet himself has occasionally taken: when considering the prototype as an inexhaustible fund of variety[m], he supposes that nature in serving her apprenticeship was not so much occupied in learning how to construct man, as how to exhibit his form and his structure, under various semblances in the animal, mineral, and vegetable kingdoms[n]. From another view which he has taken, he draws the conclusion, but through what chain of reasoning he has not mentioned, that nature is only a single act, comprehending all species of phenomena, whether past, present, or future, and that the permanency of this act constitutes the duration of things[o]. Now if this language implies any thing, it certainly implies that nature never served an apprenticeship, and that the idea of this single act, must either be false, or the idea of her apprenticeship a whimsical absurdity.

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[1] "Puisque l'homme est le prototype - - - Le prototype est un modele qui représente l'etre réduit à ses moindres termes: c'est un fond inépuisable de variations - - - Le prototype est un principe intellectuel qui ne s'altere qu'en se réalisant dans la matière." P. 6.

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[m] See the preceding note.

[n] "Une pierre, un chêne, un cheval, un singe, un homme, sont des variations graduées du prototype que a commencé à se réaliser par les moindres élemens possibles. *Une pierre, un chêne, un cheval, ne sont point des hommes; mais ils en peuvent être regardé comme des types plus ou moins grossiers en ce qu'ils se rapportent à un même dessein primitif,* et qu'ils sont tous le produit d'une même idée plus ou moins développée." P. 7.

[o] "La nature n'est qu'un seul acte. Cet acte comprend les phénomènes passés, présens et futurs; sa permanence fait la durée des choses." P. 2.

Robinet appears to be one of those who, instead of considering a sense of religion and of moral conduct among the characteristics of man, is inclined to confine his peculiar distinctions almost entirely to those degrees of his reasoning powers which enable him to cultivate the arts and sciences, and not only to procure the necessaries of life, but many gratifications and luxuries which are totally unknown to the lower animals. As these powers are calculated to give him not only a decided advantage, but despotic sway over all the inferior orders of being, they flatter his vanity, inflame his ambition, and lead him in his pride to imagine that other beings, if he thinks there are others superior to himself, must likewise owe their power and authority to similar causes. He does not reflect that the exercise of reason implies an imperfection, which he cannot impute to an omniscient and omnipotent being, to one who sees all things intuitively, who perceives at a glance all their relations from beginning to end; who has made them, known them, and bestowed on them their properties. It cannot be supposed that such a being should, like ignorant man, be groping his way by the glimmering light of reason and experiment, to that power and knowledge of which he himself is the fountain and head.

It is true that the Deity has bestowed reasoning powers upon man in a higher degree than on any other species of animal that inhabits this globe.

He has even bestowed another privilege, that of directing such powers at his pleasure to a certain extent. Yet what are the uses made of these powers? Do we not daily observe them exerted in the service of opposite interests, appetites, and passions, employed indiscriminately in the defence of virtue and vice, of piety and atheism, of order and confusion in civil society? However much we may therefore condemn that French republic which chose to personify and deify these powers, under the name of the *goddess of reason*, we can hardly object to the suitableness of the emblem under which it presented this new divinity to the eyes of her worshippers; a female, in short, who had lived in the habits, and was not ashamed to appear in the character of a common prostitute. As it can be only when these powers are properly directed that they can be creditable to the possessor, or useful to others, it may with propriety be said of them, what Cicero has said of the power of eloquence: "If guided by wisdom, it may be of great importance to a state, but without wisdom is generally injurious, and never beneficial[p]." Were such powers always to be found in direct proportion to the wisdom and virtue with which they are associated in individuals, they might then indeed be objects of envy. But this is so far from being the fact, that they and the better qualities of the heart have sometimes been found in an inverse ratio[q]. In such cases, either from our limited portion of wisdom, or the pride of displaying our free agency, do we see them much more frequently applied than misapplied in the ordinary business and intercourse of life; nay, do we not sometimes observe them employed to sink man, in point of worth and respectability, even below the level of the brute? In flocks and herds, in shoals of fishes, and in swarms of insects, where instinctive feelings chiefly predominate, what an appearance of general harmony and co-operation do we not observe! while in equally numerous assemblages of men how different is the scene presented to our view!—a constant war between opposite opinions, passions, and interests; laws multiplied to prevent crimes; crimes multiplied to evade laws; imprisonment, banishment, and death threatened to preserve order, and yet that order frequently disturbed by the very laws enacted to preserve it. Are not such too frequently the results of our reasoning powers, our free

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[p] "Ac me quidem diu cogitantem, ratio ipsa in hanc sententiam ducit, ut existimem sapientiam sine eloquentia parum prodesse civitatibus, eloquentiam vero sine sapientia nimium obesse plerumque, prodesse nunquam." *De Inventione Rhetorica*, lib. i. cap. i.

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[q] That singular combination of talents and vices, constituting the general outlines of the character which Milton has ascribed to his fallen spirits, has seldom, we should hope, been so fully exemplified by any of our species, as, according to Sully, it appears to have been by the younger Servin. "Je pris au commencement de Juin, le chemin de Calais, où je devois m'embarquer, ayant avec moi une suite de plus de deux cens gentilshommes, ou soi-disant tels, dont une partie étoit en effet de la première distinction. Le vieux Servin vint me présenter son fils, en me disant qu'il me supplioit d'essayer à en faire un honnête homme: mais qu'il ne pouvoit s'en flatter, non faute d'esprit et d'étoffe dans le jeune homme, mais à cause de son inclination naturelle pour toutes sortes de vices. Il avoit raison. Ce qu'il venoit de me dire m'ayant donné la curiosité de connoître à fond le jeune Servin, je vis tout ensemble un miracle et un monstre: je ne puis donner d'autre nom à l'assemblage des plus rares talens avec les plus vicieux. Figurez-vous un esprit si vif, qu'il n'ignoroit presque rien de ce qu'on peut sçavoir; une compréhension si prompte, qu'il saisissoit tout dès la premiere fois; et une mémoire si prodigieuse, qu'il n'oublioit jamais rien. Il possédoit toutes les parties de la philosophie, les mathématiques, particulierement les fortifications, et le dessein; et jusqu'à la théologie, qu'il sçavoit si bien, qu'il étoit, quand il vouloit, excellent prédicateur et habile controversiste pour et contre la religion réformée indifféremment. Il avoit appris non-seulement le Grec, l'Hebreu, et toutes les langues qu'on appelle sçavantes, mais encore tous les différens jargons: il en prenoit si naturellement la prononciation et les accens, que cela joint à une parfaite imitation, soit du geste, soit des différentes manières, tant des peuples de l'Europe que des provinces de la France, auroit pu le faire regarder comme étant de tout pays. Il avoit appliqué cette disposition à contrefaire toute sorte de personnes, et s'en acquittoit singuliérement: aussi étoit-il le plus parfait farceur, et le meilleur comédien qu'on pût voir. Il faisoit bien des vers. Il jouoit de presque tous les in-

strumens, sçavoit la musique à fond, et chantoit aussi agréablement que méthodiquement. Il disoit la messe; car il vouloit tout faire, aussi-bien que connoître tout. Son corps étoit parfaitement bien assorti à son esprit: il étoit adroit, souple, léger, et propre à tous les exercices: il montoit passablement à cheval: et on l'admiroit dans la danse, la lutte, et le saut: il n'y a point de jeux de récréation qu'il ne sçut; et il s'aidoit de presque tous les métiers méchaniques. Tournez la médaille; il étoit menteur, double, traître, cruel, lâche, pipeur, yvrogne, et gourmand; brelandier, débauché en tout genre, blasphémateur, athée: en un mot, on y trouvoit tous les vices contraires à la nature, à l'honneur, à la religion, et à la société: et il s'est montré tel jusqu'à la fin, qu'il est mort à la fleur de son âge, en plein bordel, corrompu par la débauche, et tenant encore le verre en main, jurant et reniant Dieu." *Mémoires de Sully*, tom. ii, *p. 182*, edit. Lond. 1747, 3 tom. 4to.

agency, and many inventions, especially when those instincts are neglected which operate in favour of religion and morals?—instincts bestowed not as the absolute controllers of our conduct, but as gentle monitors, which, until silenced by repeated contempt of their admonitions, never cease to remind us, that for the use which we make of these powers, and our free agency, we are to be held responsible to them, to the laws of our country and to our God. Such admonitory feelings are not necessary where wisdom is perfect, nor are they required where free agency and the powers of reasoning are either extremely limited or wanting. Hence it is that the lower animals, which are guided almost entirely by instincts, have no theories about morals or religion, betray no symptoms of self-reproach for violating any general law, are not troubled with melancholy reflections on what is past, nor with anxious alarms about what is either distant or future. Nor let man despise them on account of this limited sphere of their intelligence, his own intelligence is not so extensive as he fondly imagines; he knows that he lives, grows, and is nourished, but he knows not how; he sees that his feet, his hands, and his fingers, are moved by the will; but he sees not a single link of the chain by which the will and these organs are connected. Of many of the processes that are daily, and hourly, and every moment taking place in various parts of his system, he is not even conscious. As for the extent of his free agency, he has no direct influence over any of the functions, or any of the organs on which his life more immediately depends. In all matters of essential importance to himself or his species, his will, which is oftener regulated by his instincts than by his reasonings, is in no instance permitted to exercise a direct authority over the organs employed in circulation, digestion, or secretion. As his intelligence is too limited, and his reasoning too slow and too uncertain in its operations to be entrusted with the charge of such functions[1], it would seem

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[1] "The command of the mind over itself is limited, as well as its command over the body; and these limits are not known by reason, or any acquaintance with the nature of cause and effect. - - - Our authority over our sentiments and passions is much weaker than that over our ideas; and even the latter authority is circumscribed within very narrow boundaries." *Hume's Essays*, vol. ii. p. 71. edit. Edinb. 1800, 2 vols. 8vo.

In drawing inferences from causes to effects, "animals," says Hume, "are not guided in their inferences by reasoning: neither are children: neither are the generality of mankind, in their ordinary actions and conclusions: neither are philosophers themselves, who, in all the active parts of life, are, in the main, the same with the vulgar, and are governed by the same maxims. Nature must have provided some other principle, of more ready and more general use and application; nor can an operation of such immense consequence in life, as that of inferring effects from causes, be trusted to the uncertain process of reasoning and argumentation." Ibid. p. 111.

"But though animals learn many parts of their knowledge from observation, there are also many parts of it which they derive from the original hand of nature; which much exceed the share of capacity they possess on ordinary occasions; and in which they improve little or nothing by the longest practice and experience. These we denominate Instincts, and are so apt to admire, as something very extraordinary, and inexplicable by all the disquisitions of human understanding. But our wonder will perhaps cease or diminish, when we consider, that the experimental reasoning itself, which we possess in common with that the Deity has reserved to himself their superintendency, or entrusted it to an agent who holds no intercourse with us upon the subject. Nay, in the direction of those functions which we so proudly denominate the voluntary, we are apt to overlook the unknown causes through which the will operates, and the causes through which it is operated upon. From vainly supposing that we enjoy unlimited degrees of free agency, and may always act from the dictates of our reason, whether right or wrong, we disclaim the comparison between ourselves and the lower animals, which seem to be governed, if not entirely, yet principally by instincts; in other words, by what we would call the active powers, or the constitutional feelings of our nature, were we speaking of ourselves, though in speaking of them we generally prefer the contemptuous expression, blind instincts, not duly considering how much we ourselves are under the direction of such instincts.

Some philosophers have not scrupled to assert that the lower animals are mere machines, and that all the phenomena which they exhibit may be traced to mechanism. But, happening to admit, at the same time, that this mechanism, which has been rather supposed than demonstrated, was planned and executed by the Deity himself, and that all its movements are, by his supreme wisdom

beasts, and on which the whole conduct of life depends, is nothing but a species of instinct or mechanical power; that acts in us unknown to ourselves; and, in its chief operations, is not directed by any such relations or comparisons of ideas as are the proper objects of our intellectual faculties." Ibid. p. 112.

and power, adapted to the objects which he had in view, it should follow that these movements are more regularly and wisely conducted than any operations which are entrusted to the direction of human intelligence: so, be they animals, or be they machines, the conclusion is the same with respect to the wisdom that is displayed in their operations. Proceeding however on the supposition that they have feelings, desires, and aversions,—that they live, grow, assimilate food, propagate their kind, and that most of them in their structure exhibit a brain, nerves, bones, muscles, vascular systems, and secreting organs, similar to our own, I should be inclined to class them rather with animated beings than with any of those productions of art under which we enumerate pieces of clockwork. It is entirely upon the supposition that they are animated, and that their conduct, like much of our own, is regulated by instincts, or original feelings implanted by the Deity, and directed by his wisdom, that philosophers, from the days of Democritus downwards, have been led to study comparative anatomy, not merely to establish some general principles in physiology, but from numerous and striking points of analogy, to illustrate their own structure and functions. However much convinced, from daily observation, that they enjoy less intelligence, less free agency, and less of the reasoning faculty than we, yet it must be confessed that although they know not, they seem to know the means adapted to their own preservation, and that of their species; some of them even to foresee the seasons with as much certainty as if they were profoundly skilled in astronomy; some which migrate, not only to foresee the approach of the seasons, but to know the climate and the productions of remote islands, countries, and seas, as if they had studied the science of geography; many, to perceive those incipient changes in the state of the atmosphere which prognosticate winds, clouds, electricity, pressure, heat, dryness, and moisture, more readily than the most experienced meteorologists; nay, not only to perceive, but seemingly to comprehend them in all their bearings, so far as these relate to their own safety, or to that of their offspring. At the same time, while their conduct is varied, and suitably adapted to different changes, it is always varied in a uniform manner, and always alike in like times and in like circumstances; for, with the exception of man alone, every other species of animal inhabiting a country, so long as the face and climate of the country continue the same, adheres without the slightest variation to the manners, the habits, the fashions and pursuits of the earliest times. No attempt is ever seen made to invent new methods of constructing buildings, new methods of procuring food, new modes of training their offspring, new laws, new governments, or indeed any thing that had not been familiar for thousands of years to all the preceding generations of the species. From these facts it appears obvious that the primary cause which regulates their conduct is without change, is every where present, every where active, perceives what is future, and can see at a glance the whole links of a chain of relations subsisting between things that are as distant as east is from west, or as pole is from pole. With justice therefore may we say with the poet,

> "——Reason raise o'er instinct as you can,
> In this 'tis God directs, in that 'tis man[s]:"

not meaning here by such an expression to assert that the Deity takes the immediate direction of all instincts, as on that supposition they could never be either deceived or betrayed, but that He has bestowed on all the inferior orders of animals certain portions of instinctive feeling, which, though not infallible, is suited to their organisms, so fitted to regulate what anatomists term their voluntary motions, and so admirably adapted to all the ordinary varieties of circumstance to which they are exposed, that without reflection, reasoning, or experience, they more promptly, decisively, and unerringly pursue the measures that are best calculated for their pleasure, health, preservation, and comfort, than if they had enjoyed more free agency, had waited for the tardy and uncertain decisions of reason and experiment, or been entirely under the influence of such limited intelligence as has fallen to the lot of even the very wisest of men.

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[s] Pope's Essay on Man, Epist. iii. v. 97.

I am acquainted with no work in the English language, or in any other language, not excepting even the celebrated works of Reaumur and De Geer, in which the singular phenomena of instincts are more fully or beautifully illustrated, than in "An Introduction to Entomology; by William Kirby, B. A. F. L. S. Rector of Barham; and by William Spence, Esq. F. L. S.;"—a work which can never fail to be read with delight and instruction by all who have a taste for natural history, or a pleasure in admiring the wonders of Providence.

If the passions, desires, and aversions of man be much more under his control, he is conscious also, that only in proportion to this power of control is he held responsible to the laws of justice, humanity, or religion. It is not required of him to explain how his instincts were implanted, or how they operate; he feels that they are, and feels that they operate, and on such a feeling does he ground his belief, without any reasoning, any demonstration, or any other evidence on which he can pretend to rest his conviction. On similar grounds, he believes that he sees, hears, tastes, touches, and smells, though he cannot tell how; believes also that these phenomena must have a cause, whether the cause can be traced out or not; if he finds not this cause in any of the organs to which the phenomena are usually ascribed, still his belief continues unimpaired, a secret feeling irresistibly compels him to draw the conclusion, that they must have a cause, even though a cause which he cannot comprehend, of whose modes of operation he can form no conception, of whose origin his reasoning powers can give no information, and of whose relations with respect to numerous unknown causes, he must be content to remain for ever utterly in the dark. It follows then that all his reasonings and all his actions must ultimately be founded upon hypotheses, hypotheses indeed which he calls axioms, or ultimate facts; but call them what he will, they are the boundaries of his inquiries and of his intelligence; entirely matters of implicit belief, not of reasoning, not of experiment, not of demonstration, nor even of testimony. With respect to him they are hypotheses, and on such hypotheses is he compelled to act and to reason, and compelled to act (the Deity having willed it), from as blind an instinct as any that actuates the lower animals. Proud as he may be of his intelligence, his free agency, and his reasoning powers; from infancy to manhood, from manhood to old age and decrepitude, he has no choice, no alternative, but to walk by his faith as much as by his sight.

I have been led to these considerations from observing that the opinions of Robinet are also the opinions of other philosophers[t], who, entertaining exalted ideas of their own nature, and thinking it inferior only in degree to that of the Deity, have presumptuously supposed that his ways, his thoughts, and his modes of operation, are similar to theirs; and that therefore, in creating and governing the universe, he must have adopted the like methods, laboured under the like difficulties, and met with a number of the like disappointments, as they experience in planning and constructing a piece of machinery[u]. Their conclusion certainly would have been different, had they been aware that their boasted fate, chance, and necessity are but mere words; that the sovereign of the universe can have no superior; that he is not, like them, governed by instincts, or any unforeseen or unknown causes; that his will never operates in vain, and never operates in a way that he knows not; that, from his unlimited degree of intelligence, he cannot be supposed to act upon data which he does not comprehend, or have recourse to reasoning and experiment to discover what, previously to reasoning and experiment, he thoroughly understands; that from being impassive, and possessed of unlimited degrees of power, he cannot labour under a sense of debility or pain, experience any thing like impatient desire, or be forced to have recourse to artifice, sophistry, or false pretences to accomplish his will; in short, his wisdom can never be prostituted, as our reasoning powers too frequently are, to gratify resentment, interest, vanity, or factious ambition.

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[t] "Ces traits n'ont point échappé aux génies observateurs; et si j'entreprends aujourd'hui de mettre dans un plus grand jour une pensée que d'autres ont eue avant moi, content de donner quelques nouveaux degrés de certitude, selon ma foible capacité, à ce qui a été proposé plûtôt comme une conjecture ou un doute, que comme une vérité, je me fais un devoir de rapporter la gloire de la découverte à ceux à qui elle appartient." Robinet, *Considerations Philosophiques*, p. 2.

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[u] "Lorsqu'on étudie la machine humaine, cette multitude immense de systêmes combinés en un seul, cette énorme quantité de piéces, de ressorts, de puissances, de rapports, de mouvemens, dont le nombre accable l'esprit, quoiqu'il n'en connoisse que la moindre partie, on ne s'étonne pas qu'il ait fallu une si longue succession d'arrangemens et de déplacemens, de compositions et de dissolutions, d'additions et de suppressions, d'altérations, d'oblitérations, de transformations de tous les genres, pour amener une organisation aussi savante et aussi merveilleuse." Ibid. p. 4.

SECTION XIV.

OPINIONS OF BLUMENBACH.

The idea of an eternal being, possessed of unlimited power and intelligence, who watches over the affairs of men, continues their existence beyond the grave, and who, so far as they have a control over their conduct, is to render them accountable for their motives and actions, is an idea not equally cherished by every individual. From its being however almost universal, and strongly supported by some instinctive feelings of our nature, no devices, however ingenious, or ardently pursued, have hitherto been successful in eradicating it entirely from the minds of men, even of those who have most strenuously attempted its suppression. That there is some invisible agent who superintends the affairs of the universe, all are willing and ready to acknowledge, but all are not equally willing to acknowledge that this agent is possessed of intelligence and moral attributes; that he watches over the conduct of men; that he knows the secret recesses of their hearts, or that he will one day make them responsible for their motives and actions. Their inclinations therefore induce them to fancy other agents, more suitable to their wishes, such as nature, fate, chance, and necessity, or certain invisible energies or powers diffused throughout space; which operate methodically, yet without intelligence[x], are divested of every thing like moral attributes, and which, if not traced to matter or its properties, are to be traced to no other cause that either is or ought to be named. It is to one of these abstract powers that the celebrated Professor Blumenbach of Göttingen has ascribed the organization of animals, bestowing upon this child of his fancy some peculiarities which he thinks ought to recommend it by their novelty. These peculiarities, however, are such as constitute neither a new genus nor a new species. In generic character it cannot be distinguished from those powers which are termed laws or tendencies of nature: in specific character it appears not to differ from those powers which are styled plastic, formative, or spermatic[y]. Even its name, which in Latin is *nisus formativus*, presents nothing new to those who have heard of the *vis formatrix*, or of the *nisus* of Vander Kemp; a generic power including that species of *adpetitus* which Darwin denominates a formative appetency, or a formative propensity[1]. It is very true, that by a few peculiarities it may be distinguished from the *vis essentialis* of Professor Wolff,

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[x] "Alii naturam censent esse vim quandam sine ratione cientem motus in corporibus necessarios." *Cicero de Nat. Deor* lib. ii. § 32.

[y] See above, p. 76.

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[1] "Cadaveris particulæ positiva vi, et propria actione se mutuo fugere videntur, et a se invicem recedere, et hoc uno forte respectu materia mortui corporis tantum non iners est, sed vitali unioni inimica sui ipsius dissolutionem promovet. Id certum est, omnem vim particulis cadaveris inhærentem ita esse determinatam, ut sub iisdem conditionibus destruatur, ac dissipetur fabrica, sub quibus eam in vivente corpore harmoniam partium conservari cernimus, per quam omnes in unius corporis organici constitutionem conspirant. Imo, si accuratius, ac majori diligentia, quæ in vivente occurrunt contemplemur, omnia vitæ phenomena ad unitatis hunc adpetitum tanquam principium universale reduci posse deprehendimus. ADPETITUM voco *nisum ex interno principio proficiscentem in statum futurum.*" *Dissertatio Medica, exhibens Cogitationes Physiologicas de Vita, et Vivificatione Materiæ Humanum Corpus constituentis,* p. 7. Edinb. 1782, 8vo.

John Theodore Vander Kemp, the author of this thesis, the son of a clergyman, and a native of Rotterdam, was early distinguished by his learning and talents while a student at Leyden. His first profession was that of a soldier, in which he continued for sixteen years, equally distinguished by his military prowess, his habits of study, and his extensive literary acquirements. Arriving at the rank of a captain of horse, and the prospect of much higher promotion, he relinquished the army, and came to Edinburgh, determined to prosecute the study of physic. As a proof, however, that this transition was not so abrupt as might be imagined, he some years before, in 1775, had published at Leyden a small work, with the title of *Tentamen Theologiæ Dunatoscopicæ,* in which he favours the doctrines of Parmenides, a Greek philosopher of the Eleatic school. On arriving at Edinburgh, he commenced another work as a sequel to the former, entitled *Parmenides, sive de Stabiliendis per Adplicationem Principiorum Dunatoscopicorum ad Res Sensu, et Experientia cognoscendas Scientiæ Cosmologicæ Fundamentis.* The title is a specimen of that quaint, a power supposed to distribute nourishment to the different parts of an animal or plant, and even to deformed and unnatural excrescences, where Blu-

obscure, and diffuse style in which the work is written. It was published at Edinburgh in 1781 in octavo, and, including the index, amounts to 527 pages. It displays much metaphysical acumen, and an intimate acquaintance with most of the writers, ancient and modern, who have written on cosmology; yet, so far as I know, is very little known, very little read, and has never been reprinted, although the author, in the vanity of his heart, has annexed his autograph to the prefatory epistle, to distinguish the genuine from the spurious editions. In 1782 he published the thesis which I have quoted, and dedicated it to his friend Dr. Edmund Goodwyn, at that time president of the physical society, and member of the medical society of Edinburgh. On taking the degree of doctor of physic, he returned to Holland, where he soon became distinguished as a practical physician; but happening to lose his wife and his daughter in an excursion near the harbour of Dort, where he himself narrowly escaped from drowning, he became thoughtful, and soon afterwards a real convert to the Christian religion, which till then it would seem he had only professed. In this state of mind, though, for some time at least, not indifferent to professional duties, he at last renounced them to live in retirement. Having there met with an address circulated by the Missionary Society of London, he came over to Britain, was introduced to the society, and, under its patronage, after learning to make bricks with his own hands, he went to propagate the gospel in Southern Africa, where he died in 1811, in the 64th year of his age, as much distinguished by his zeal, activity, and laborious exertions in this last of his professions, as he had been in any of the former. Thus powerful as were the energies of his mind, they seem to have generally yielded in strength to the ardour of his heart, which, in assuming the direction of his actions, and changing his measures apparently without much deliberation, always enabled him to pursue with vigour and singular success the objects which he had immediately in view. I have menbach says that his *formative nisus* does not act at all; and besides, observes, that in feeble constitutions the formative nisus is always strong, where the vis essentialis of Professor Wolff is supposed to be weak. He is not, however, equally fortunate in showing the distinction between his nisus and the δυναμις διαπλαστικη or δημιουργικη of the Aristotelians, denominated in Latin the vis formatrix. If he does not actually admit their identity, he admits at least a striking similarity[a]. Nay, he presumes not to point out the difference; he only says, that he should be extremely happy if any person would name one of the old writers, who, in describing the vis plastica, has given such a distinct idea of it, or such a one as corresponds so well with the phenomena of generation as that

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given this summary account of his life, partly as corroborative of some of those remarks that were made upon instinct, which tended to show that it is not for man, much more than for animals guided by instinct, to mark out the path by which he is afterwards to direct his steps.

[a] "Of all the authors who have treated of this power, F. Bonamica, the well-known disciple of Aristotle, explains himself perhaps the most correctly, *De Formatione Fœtus*, p. 528. 'Spiritus in aërea seminis substantia comprehensus, aspersus autem a calore cœlesti, et vi a patre accepta, et ea quam a cœlo participat in uterum fœminæ conjectus, concoquet materias a fœmina infusas, et pro ratione ipsarum variis modis afficiens efficit instrumenta. Dum vero ea fabricat, *appellatur Facultas διαπλαστικη seu δημιουργικη. Sed ubi extructa fuerint instrumenta, ut iis uti queat, quæ prius erat vis formatrix, illis utens degenerat in animam.*" Blumenbach's Essay on Generation, translated by Dr. Crichton, p. 25. London, 1792, 12mo.

which he has attempted to give, especially in the third section of his essay[b].

Drelincourt, one of the preceptors of Boerhaave, has collected, he observes, no fewer than two hundred and sixty-two vague hypotheses concerning generation, which, when examined, are only branches of two great roads, the one leading to epigenesis, and the other to evolution[c]. From the passage just quoted in the note, it seems to be implied that the nisus formativus is little more than one of the Aristotelian branches that led to epigenesis, and though modernized and somewhat altered for the sake of novelty, is, notwithstanding, scarcely distinguishable from the vis formatrix or δυναμις διαπλαστικη of Bonamica[d]. Besides, what are the new views which this new road presents to the traveller? or, dropping the metaphor, and calling it a hypothesis,—what is that species of new information which it conveys? Does it amount to more than a truism to say, that a plant or an animal is formed by the power that formed it? Is it not recurring to that old and obsolete mode of explaining phenomena, by which creation was ascribed solely to a vis creatrix, generation to a vis genetrix, concoction to a vis concoctrix, and the healing of a wound to a vis medicatrix? Mr. Hunter certainly explains nothing by his stimulus of death[e], by his stimulus of necessity[f], or his stimulus of cessation[g]: nor are the phenomena of muscles illustrated by his stimulus of relaxation[h], by his stimulus for contraction[i], or his stimulus for expulsion[k]. Yet Blumenbach pretends to something more. He pretends to have ascertained the laws by which his formative nisus operates. Now, what are those laws? In hearing of such laws, the reader may probably expect to be informed how a brain, a stomach, a heart, its blood-vessels, or even a whole animal, may be constructed. But he is to be informed of no such things; he is only to be told that young animals grow faster than old ones; that although the incubations of oviparous animals be of shorter duration than the periods of gestation in the class of mammalia, yet the human fœtus being farther advanced in the nineteenth week of gestation than a chick in the proportional period of incubation is in a hundred and twenty-nine hours, it follows, he thinks, that the several processes of organization are more rapid in the class of mammalia than they are in the class of oviparous animals; and, lastly, he observes, that in both classes of animals there are some organs, for instance, the brain, which are found in general to be more uniformly organized than others.

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[b] See above, p. 25.

[c] Invisible powers or invisible beings, supposed to be the immediate causes of the definite forms and organisms in nature, have by some philosophers, and particularly by Cudworth, been termed plastic; they are described under different names and characters by different sects and individuals, who being possessed of different capacities and degrees of mental energy, have reasoned, not only from different sources of conjecture, but from experiments and observations, different in kind, differently performed, and differently interpreted. And hence it is, that while most philosophers are willing to admit a plastic nature, each must have one in some measure peculiar to himself, adapted to his prejudices and his hypotheses.

[d] P. 4.

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[e] Treatise on the Blood, Inflammation, and Gunshot Wounds, p. 87. London, 1794, 4to.

[f] Ibid. p. 24.

[g] Ibid. p. 102.

[h] Ibid. p. 104.

[i] Ibid. p. 102.

[k] Ibid. p. 104.

Such are the three observations of Blumenbach, on which he has founded the three great primary laws of his formative nisus. In his own language, the first law is, that "the activity of the nisus is in an inverse ratio to the age of the organized body;" the second, that "the formative nisus is much more active in the embryos of mammalia than in those of oviparous animals;" the third, that "in the formation of some particular parts of any organized body, the formative nisus is much more regular in its process than in that of others.[1]" Now the novelty of these three laws certainly appears to consist more in the language than the meaning; a species of novelty which cannot be supposed to have any strong claim on our admiration, if we consider that the same ideas may be easily expressed in varieties of words, phrases, and forms. How many, for instance, how many hundreds and thousands of names must the sun and the moon have received in their time from the fleeting and scattered nations of the earth since the creation! If nurses and children be able to invent new modes of speech, and if there be not found any savage tribe on the face of the globe which has not a language in some respects peculiarly its own, where can be the merit of inventing new words or new phraseologies? Nay, is it not common with men of very superficial talents, when elated with a high opinion of themselves, and aspiring to the character of original thinkers, to conceal, or at least attempt to conceal, the triteness and nothingness of their ideas in unusual epithets, conceited enigmas, and other affected eccentricities of language? I am far from presuming, even in thought, to class Blumenbach with men of that description: I only regret that a person of his justly acquired reputation should have ever descended to practise their arts. To the penetrating mind, the trite idea must appear trite, in whatever language it may be expressed, as the actor on the stage, however skilful, must always retain something of himself, by which he may be traced through diversities of names, dresses, characters, and tones of voice. It is true indeed, that a very great proportion of mankind, not much accustomed to look beyond the surface, are apt to imagine that a difference in language should always imply a difference in the sense. It is thus that the sun, under different names, and honoured by different religious ceremonies, has been multiplied into many different divinities; and thus also that successive theories in physic, in physiology, and in metaphysics, have originated in the same or nearly the same identical facts, just as successive generations of leaves are observed to spring from the same tree, while the tree itself, if arrived at maturity, continues unaltered, or suffers only imperceptible changes.

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[1] P. 75, 78, and 79.

But what here, it must be confessed, is apparently new, is Blumenbach's attempt to vindicate the practice of considering a power as distinct from the agent in which it resides, or from which it proceeds; of giving a name to this power, and yet refusing a name to the agent which exercises it; of speaking of the power as a thing that is known, and of the agent as only a species of some occult quality. In support of this practice, he appeals to a high modern authority, to the illustrious example of Newton, who says, near the end of his treatise upon optics, " What I call attraction may be performed by impulse, or by some other means unknown to me. I use that word here to signify only in general any force by which bodies tend towards one another, whatsoever be the cause [m]." In affecting here to imitate Newton, " it is to be hoped," says Blumenbach, " that there is no necessity for reminding the reader that the expression formative nisus, like that of attraction, serves only to denote a *power*, whose constant operation is known from experience, but whose cause, like the causes of most of the qualities of matter, is a *qualitas occulta* to us [n]." From this language are we not to understand that the nisus is a power deriving its origin from some occult quality; and that this quality, though totally unknown, has nevertheless been found to be a quality of matter? The question follows, of what matter is it a quality? Blumenbach admits, that it is not a quality of matter in general, that it is confined to organized bodies, and to be found in those bodies only when in that state which is termed living; that it seems to depend on the powers of life; that it is a quality of living bodies, but as distinct from the other qualities of living bodies, sensibility, irritability, and contractility, as from the common properties of dead matter. This second view is certainly very different from the first, where it was a power deriving its origin from some occult quality of matter. Instead of a power derived from such a quality, it appears now to be a quality itself; and instead of being dependent on matter, is made dependent on the powers of life, though, in order to preserve something like consistency, it is also insinuated that the powers of life and the powers of matter may be the same, as upon the well-known hypothesis of Buffon, the general division of matter ought to be into living and dead, and not into organized and brute matter. Dissatisfied, however, with this second view, as well as with the first, Blumenbach has recourse to four more: in a third view, the nisus is represented not as a power, nor as a quality, nor as dependent on the causes of life, but as an action gradually induced or taken on by matter when in a certain state of preparation; and when arrived at a certain destination; a view somewhat similar to Needham's, who supposed that matter was gradually *vitalized* in proportion to its state of organization; upon which hypothesis the nisus is not the cause of the organism, but the state of the organism the cause of the nisus. In a fourth view, this same nisus is one of the properties of the living principle. In a fifth view, if his sentiments be similar to those of Bonamica, as he says they are, this same property of the living principle comes at last to be the living principle itself. In the sixth view, from being considered as the chief principle of generation, growth, nutrition, and reproduction, it is honoured with the title of bildungstrieb, or nisus formativus[o].

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[m] Optics, p. 351, 3d edit. London, 1721, 8vo.

[n] P. 20.

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[o] Blumenbach informs us, that having spent a great deal of his leisure moments in the investigation of this subject, both in experiment and reflection, the consequence has been a thorough conviction, "that there is no such thing in nature, as pre-existing organized germs; but that the unorganized matter of generation, *after being duly prepared, and having arrived at its place of destination, takes on a particular action or nisus,* which nisus continues to act through the whole life of the animal; and that by it the first form of the animal or plant is not only determined, but afterwards preserved, and when deranged, is again restored. *A nisus, which seems therefore to depend on the powers of life,* but which is as *distinct from the other qualities of living bodies,* (sensibility, irritability, and contractility) as from the common properties of dead matter; that it is *the chief principle of generation, growth, nutrition, and reproduction;* and that to distinguish it from all others, it may be denominated the formative nisus (bildungstrieb, or nisus formativus"). P. 20.

Let us now inquire how far Blumenbach, in his mode of investigation, has imitated Newton, and how far his nisus, in its cause and its consequences, resembles attraction. He must surely have known that Newton considered a total inertness, or what he denominates a vis inertiæ, to be common to every thing which in his time was called matter; that on this supposition his first law of motion, on which are founded the other two, is, that every body continues in a state of rest or motion, until it is compelled to change that state by some impulse acting from without: an impulse which is not confined like the nisus to organized matter, to matter in any particular state of preparation, or to matter of any particular description; but is represented as acting indiscriminately upon all bodies, living and dead, organized and unorganized, at all times and in all places. Its immediate cause, like that of the nisus, is not supposed to be an occult quality, but a substance; and though a substance

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"So far," says Blumenbach, "do I consider it as an argument, not of the least importance, for proving the existence of the formative nisus in organic bodies, that even in the inorganic ones there exist traces of a formative power; not of a formative nisus, however, at least in the sense [in which] this word is used in this work; for here it is considered as one of the properties of the *living principle,* and consequently not to be imagined as belonging to dead matter." P. 60.

In the passage quoted from Bonamica, p. 292, of this Inquiry, the δυναμις διαπλαστικη, which Blumenbach considers as similar to his nisus, becomes at last, when employing the organs which it had constructed, the soul itself: "quæ prius erat vis formatrix, illis utens degenerat in animam."

seemingly unknown, or at least hypothetical, it is not considered by Newton as unworthy of a name. He calls it æther, and in his queries hints at varieties of its properties. He fancies it a medium exceedingly more rare and subtile than air, and exceedingly more active and elastic, pervading all bodies, and by its elasticity, expanded through all the heavens [p]. He insinuates the manner in which it may possibly be the cause of gravitation; how, in being interposed between particles of matter, it may prevent them from coming into contact under great pressure; and how it may occasion the light to be reflected before it reaches the surface of a mirror [q]. And yet with all these imaginary powers, Newton certainly would never have ascribed the organization of plants and animals to this medium, to his principle of attraction, or to any thing falling under the description of this nisus formativus of Blumenbach. "The wonderful uniformity in the planetary system," says Newton, "must be allowed the effect of choice. And so must the uniformity in the bodies of animals; they having generally a right and a left side shaped alike, and on either side of their bodies two legs behind, and either two arms or two legs, or two wings before upon their shoulders, and between their shoulders a neck running down into a back-bone, and a head upon it; and in the head two ears, two eyes, a nose, a mouth, and a tongue, alike situated. Also the first contrivance of those very artificial parts of animals, the eyes, ears, brain, muscles, heart, lungs, midriff, glands, larynx, hands, wings, swimming bladders, natural spectacles, and other organs of sense and motion; and the instinct of brutes and insects can be the effect of nothing else than the wisdom and skill of a powerful ever-living agent, who being in all places, is more able *by his will* to move the bodies within his boundless uniform sensorium, and thereby to form and reform the parts of the universe, than we are *by our will* to move the parts of our own bodies. And yet we are not to consider the world as the body of God, or the several parts thereof, as the parts of God. He is an uniform being, void of organs, members, or parts, and they are his creatures, subordinate to him, and subservient to his will; and he is no more the soul of them, than the soul of a man is the soul of the species of things carried through the organs of sense into the place of its sensation, where it perceives them by means of its immediate presence, without the intervention of any third thing. The organs of sense are not for enabling the soul to perceive the species of things in its sensorium, but only for conveying them thither; and God has no need of such organs, he being every where present to the things themselves[r]."

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[p] "And is not this medium exceedingly more rare and subtile than the air, and exceedingly more elastick and active? And doth it not readily pervade all bodies? And is it not (by its elastick force) expanded through all the heavens?" *Optics*, p. 324.

[q] "Is not this medium much rarer within the dense bodies of the sun, stars, planets, and comets, than in the empty celestial spaces between them? And in passing from them to great distances, doth it not grow denser and denser perpetually, and thereby cause the gravity of those great bodies towards one another, and of their parts towards the bodies; every body endeavouring to go from the denser parts of the medium towards the rarer?" Ibid. p. 325.

"And doth not the gradual condensation of this medium extend to some distance from the bodies, and thereby cause the inflexions of the rays of light, which pass by the edges of dense bodies, at some distance from the bodies?" Ibid. p. 324.

This species of reasoning, be it right or wrong, certainly bears no resemblance to that reasoning or that philosophy which Blumenbach has adopted in his Essay on Generation. "To tell us," says Newton, "that every species of things is endowed with an occult specifick quality, by which it acts and produces manifest effects, is to tell us nothing[s]." He might have added, that it is not only to tell us nothing, but to tell us even that nothing more remains to be told; that occult qualities are the ultimate boundaries of all our inquiries; that all beyond them is a mere chimera; and that, therefore, to talk of any other primary causes, is not only unphilosophical but absurd. In making these remarks, it is hoped the intelligent reader will perceive that *occult quality* is not a phrase of the same import as *unknown cause.* Unknown cause has not in itself the least tendency to induce the mind to suppose that such a cause is material. Occult quality, on the other hand, being generally confined to physical discussions, has always that tendency, and is therefore apt to betray the mind, when not upon its guard, into the supposition that such a quality, however occult, is a quality of matter. On that account, the phrase *occult quality*, with a certain class of physical writers, is generally preferred to *unknown cause*. It is thus that Lucretius would have us to believe that the cause of growth in a seed or a plant is nothing but a nameless *secreta facultas*[t]: it is thus that Blumenbach would endeavour to persuade us, that after much study and reflection, he could trace the cause of organization to nothing beyond an occult quality: it is thus that Voltaire is so ready to inform us, that almost all the phenomena in nature are the effects of occult qualities[u]; and thus that Buffon, as well as Lucretius, has avowed his hostility to final causes[v], causes so different from occult qualities, that instead of proving obstructions in the way, they invariably carry us beyond matter, and point to a cause of a different kind, to a being of supreme power and intelligence, to which the mind is instinctively led to ascribe moral attributes. We are not then hastily to imagine that these numerous and obtrusive intimations of occult qualities have been charitably intended, to convince us of our ignorance, to inspire us with modesty, to inform us that the ways of God are unsearchable, and that we should be humble in our own conceits. Considering the men by whom these intimations are given, men accustomed to talk as familiarly of the laws of nature as if all her laws were of their enactment, we cannot entertain that idea for a moment; especially as those occult qualities are seldom brought forward, unless when calculated to serve as apologies for certain articles in the creeds of materialists, or when they can conveniently, as stumbling blocks, be thrown in the way of those who, like Newton, might be desirous to penetrate beyond the precincts of matter, and to search for more adequate causes to explain the appearances of design and intelligence in the works of creation.

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[r] Optics, p. 378.

[s] Ibid. p. 377.

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[t] See above, p. 51.

[u] "Il falloit respecter les qualités occultes; car depuis le brin d'herbe que l'ambre attira, jusqu'à la route que tant d'astres suivent dans l'espace; depuis la formation d'une mite dans un fromage jusqu'à la Galaxie; soit que vous considerez une pierre qui tombe, soit que vous suiviez le cours d'une comete traversant les cieux, tout est qualité occulte."—Voltaire, as quoted in the Essay on Generation, p. 21.

[v] See above, p. 59, 60, 61.

Besides, the reader must have observed, that there is always a tacit confession necessarily implied in the word *occult*, not seemingly a voluntary, but an extorted confession, that the quality of which occult is the epithet, has rather been supposed than ever demonstrated to be a quality of matter. If then, in the present state of our existence, it be through the medium of matter only that an invisible incorporeal being can manifest its powers, so as to render them objects of perception, are we thence necessarily led to conclude, that because those powers exhibit their effects through the medium of matter, they must originate in matter? and that, on account of their being concealed, and never the immediate objects of sense, they ought to be termed its occult qualities? Admitting this conclusion, would it not follow, that there may be no invisible beings; that the occult qualities of matter may account for phenomena as well as they; and upon the supposition that those qualities are the causes of life and organization, yet, being mere qualities of matter, and having no claim either on our gratitude or veneration, might they not relieve many a mind from its apprehensions with respect to a deity and a future state? The answer is obvious, that, on this supposition, they certainly might; but before such an idea be adopted, if truth is to be preferred to expediency, would it not be proper first to inquire, whether or not there be any fallacy or any sophism lurking in the species of reasoning that leads to it? Thus may it not be asked, how does it happen that those occult qualities are generally conceived as acting independently of the very agents of which they are the qualities? Can they not act in concert with their agents, or not act in concert with their obvious qualities, form, extension, and the *vis inertiæ?* It would appear that they cannot, at least conveniently or with advantage; and hence it is, that those who employ them to explain phenomena, conceiving them as unconnected with their agent, or its *vis inertiæ*, proceed to personify them, consider them as having a separate existence, and after thus exalting them in fancy to the dignity of agents, presume to talk of their powers, their properties, their functions, of the laws by which they act, and even of their qualities: for, employed now to personate agents, it falls to be supposed that, like every other agent, they must also have their qualities; and hence, by this trick of personification, are qualities made to beget qualities, as it were by a process of generation. Thus the formative nisus, itself a quality, is made to be the quality of another quality, which Blumenbach informs us he has found to be occult, like the cause of attraction, and most of the other qualities of matter. But if he here affects to imitate Newton, where, it may be asked, has Newton ascribed the phenomena of attraction to such a quality? where has he hinted that the cause of attraction is a quality of matter, or where insinuated that matter should be held as an ultimate cause? Does he any where instruct the natural philosopher to stop, when he comes to what have been termed its occult qualities? Does he any where advise him to make these the boundaries of his researches, or any where tell him, that all beyond them is impenetrable darkness, where no causes are to be expected, or where, if expected, they are not to be traced? The very contrary appear to have been the sentiments of Newton, and so very anxious is he to avow them, that he even repeats them. "The main business of natural philosophy," he observes, "is to argue from phænomena without feigning hypotheses, and to deduce causes from effects, till we come to the *very first cause*, which certainly is not mechanical; and not only to unfold the mechanism of the world, but chiefly to resolve these and such like questions. What is there in places almost empty of matter, and whence is it that the sun and planets gravitate towards one another, without dense matter between them? Whence is it that nature doth nothing in vain; and whence arises all that order and beauty which we see in the world? To what end are comets, and whence is it that planets move all one and the same way in orbs concentrick, while comets move all manner of ways in orbs very excentrick, and what hinders the fix'd stars from falling upon one another? How came the bodies of animals to be contrived with so much art, and for what ends were their several parts? Was the eye contrived without skill in opticks, and the ear without knowledge of sounds? How do the motions of the body follow from the will, and whence is the instinct in animals? Is not the sensory of animals that place to which the sensitive substance is present, and into which the sensible species of things are carried through the nerves and brain, that there they may be perceived by their immediate presence to that substance? And these things being rightly dispatch'd, does it not appear from phænomena that there is a being incorporeal, living, intelligent, omnipresent, who in infinite space, as it were in his sensory, sees the things themselves intimately, and thoroughly perceives them, and comprehends them wholly by their immediate presence to himself: of which things the images only carried through the organs of sense into our little sensoriums, are there seen and beheld by that which in us perceives and thinks. And tho' every true step made in this philosophy brings us not immediately to the knowledge of the first cause, yet it brings us nearer to it, and on that account is to be highly valued [w]."

In this language, does Newton any where give the least countenance to the crude idea, that the phenomena of organization may be owing to the qualities of some occult quality of matter? Most certainly not. Much as he admired the order and beauty which he saw in the world, and much as he must have wondered and felt when he first ascertained those laws of motion which the planets are made to observe in their orbits, he nevertheless appears to have been equally if not more struck with those indications of design and intelligence displayed in the structure of animal bodies; and therefore refers to them oftener than once, as proofs irrefragable that the first of causes must be a being incorporeal, living, intelligent, omnipresent, who sees all things and directs all things by his wisdom and his power. How different then are the results of Newton's reflections from those of Blumenbach, who can only trace the phenomena of life and organization to an occult quality of matter, which he supposes to be the principle that animates his body? If he could have demonstrated such an hypothesis, would it not follow, that all the arguments which Newton has adduced in proof of an incorporeal deity must fall to the ground with no more weight than that of a feather? If it can be proved that the substance within us which feels and thinks, and is conscious of its actions, derives its existence from the qualities of matter, with much greater force (as there we want the evidence of consciousness) might it not be argued that all the indications of design and intelligence displayed in the motions of the heavenly bodies, and in the orderly arrangements of the universe, might be the effects of some other species of those occult qualities of matter? But fortunately it happens that in such hypotheses we generally perceive more of the wishes of the author than of his proofs. Instinctively led to ascribe phenomena to some cause or other, our wishes are too frequently consulted with respect *to the cause in whose favour we ought to decide;* and hence, as the notion of a deity *is not always agreeable to the inclinations,* how much ingenuity do we not see frequently exerted to trace those phenomena which appear to indicate design and intelligence to any other cause rather than to the supreme being? In discussions concerning the ultimate cause of physical phenomena, if his existence be not openly denied, how often is it not industriously concealed, and himself treated as an *omnino nominis expers* by many physiologists! who, rather than trace such phenomena to him, would ascribe them to the senseless particles of matter; to the qualities of some of their occult qualities; to their chemical affinities; to their imaginary desires and aversions; to their fancied lives, fancied perceptions, fancied intelligence, fancied recollections, or fancied forms; if not to these, to mere abstract ideas of the mind, such as fate and necessity, or to laws beyond the reach of conception, enacted without any legislator, and executed without any one to enforce them: or, lastly, to certain insulated powers existing in nature and belonging to no agent whatever; a species of causes which they would certainly never have assigned, had they only foreseen that such powers existing by themselves, and no material agent to claim them, would almost instinctively be ascribed to an agent of a different description, and thence lead the mind to the thoughts of a deity. Hume, in this instance, perceiving the error into which they have been incautiously betrayed, by admitting the existence of abstract powers, has endeavoured to show that the notion of power is a vague idea, carelessly adopted without accurate observation or mature reflection; that in the connexion, or rather the conjunction between what are termed cause and effect, we see nothing but mere antecedence and sequence, and that consequently there are no ideas, which occur in metaphysics, more obscure and uncertain, than those of *power*, *force*, *energy*, or *necessary connexion* [x]. "So that, upon the whole," he observes, "there appears not, throughout all nature, any one instance of connexion which is conceivable by us. All events seem entirely loose and separate. One event follows another; but we never can observe any tie between them. They seem *conjoined*, but never *connected*. And as we can have no idea of any thing, which never appeared to our outward sense or inward sentiment, the necessary conclusion seems to be, that we have no idea of connexion or power at all, and that these words are absolutely without any meaning, when employed either in philosophical reasonings or common life[y]." In such cases, "all we know is our profound ignorance[z];" and how we come to know even that, he has not explained, and perhaps had no explanation to give, but that he found it, as Lucretius found the use of his legs, his hands, and his eyes, by means of experience; and yet how he came, without any knowledge, to find out experience, and by it the art of instructing himself in this profound ignorance, is another mystery equally surprising, although it would seem he had no inclination ever to reveal it.

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[w] Optics, p. 344.

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[x] Essays, vol. ii. p. 65. Edit. Edinb. 1800. 2 vols. 8vo.

SECTION XV.

OPINIONS OF GASSENDI.

THE learned Gassendi, not unwilling to admire, or even to magnify the properties of matter, had never perceived in it that inherent vitality to which Buffon, Maupertuis, and Robinet, have ascribed such a number of wonderful phenomena. Partial to that species of atoms which are supposed to be constantly in motion, and chiefly distinguishable by their forms and magnitudes, he prefers the opinions of those philosophers who ascribe its phenomena to mechanical causes. In support of his hypothesis he has written no fewer than three volumes folio on the life and philosophy of Epicurus[a]: and though not so adventurous as in every instance to vindicate the doctrines of that philosopher, by defending indiscriminately all his arguments, or adopting indiscriminately all his conclusions, yet, nevertheless, where he finds it practicable, he seems strongly inclined to represent them under favourable colourings. Apparently, therefore, with the intention of lulling general prejudices, and of obtaining a more patient hearing to his explanations, he hints in the very title of his work[b], that the great object with Epicurus, in all his philosophical investigations, was to improve the system of ethics: but as his system happened to be one without any of the sanctions of religion, and as Gassendi chanced to be invested with the sacred office, and was besides professedly a zealous orthodox son of the catholic church[c], he could not in silence pass over the defects of his master: he therefore admits, although in opposition to Epicurus, that the souls of men are immortal[d], that the Deity is the creator of the world[e], the governor of the world[f], and a constant observer of the conduct of men[g]; that the maxim of the ancients, *ex nihilo nihil, in nihilum nihil,* must not be interpreted as having any reference to *his* power[h], and that final causes, though totally rejected by Epicurus, are, notwithstanding, important objects of philosophical investigation[i]. With respect to physics, although Gassendi be a strenuous supporter of what is styled the atomical philosophy, it is not the philosophy of Epicurus, but his own interpretation of that philosophy, which he seems to defend; an interpretation which makes it approximate to the corpuscular philosophy of Bacon, whose opinions he oftener than once obtrusively opposes to those of Des Cartes. He nowhere openly ventures to maintain, that the atoms are any thing more than the materials of which the visible world is composed; he nowhere insinuates that they had arranged the system of the universe, or that they had formed the structures of animals, which, he labours to prove by varieties of argument, must have been the effects of design and intelligence. He generally limits the properties of his atoms to those which are mechanical; and while defending Epicurus and Lucretius, exposes with some ingenuity and force the leading doctrines of the hylozoists, who endow their atoms with a species of life. The reader cannot have forgotten the extravagant ideas of Buffon and Maupertuis, with respect to their living organized particles; ideas certainly more fanciful than any to be found throughout the whole Metamorphoses of Ovid, who, if he transformed one individual into another

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[y] Essays, vol. ii. p. 77.

[z] Ibid. p. 76.

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[a] Petri Gassendi Animadversiones in decimum librum Diogenis Laertii, qui est de Vita, Moribus, Placitisque Epicuri. Lugduni, 1649, 3 tom. folio.

[b] "Continent autem Placita, quas ille treis statuit Philosophiæ parteis;

I. CANONICAM nempe, habitam DIALECTICÆ loco:
II. PHYSICAM, ac imprimis nobilem illius partem METEOROLOGIAM:
III. ETHICAM, CUJUS GRATIA ILLE EXCOLUIT CÆTERAS."

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[c] "Although he," (Gassendi) says Professor Stewart, "is at the utmost pains to guard his readers against the dangerous conclusions commonly ascribed to his master, he has nevertheless retained more than enough of his system to give a plausible colour to a very general suspicion, that he secretly adopted more of it than he chose to avow." *Dissertation on the Progress of Metaphysical, Ethical, and Political Philosophy,* p. 108.

[d] "Esse animos hominum immortaleis, contra Epicurum." Vol. i. p. 549.

[e] "Esse Deum authorem mundi, contra Epicurum." Ibid. p. 706.

[f] "Esse Deum rectorem mundi, contra Epicurum." Ibid. p. 725.

[g] "Gerere Deum hominum curam, contra Epicurum." Ibid. p. 738.

[h] "Cum istud effatum, *ex nihilo nihil, in nihilum nihil,* admitti valeat in Epicuro, Philosophisque cæteris, quatenus intra naturæ vireis, et quasi metas consistitur; intolerabile tamen est, quatenus ab illis extenditur etiam ad divinam vim." Ibid. p. 164.

[i] The chapter in favour of final causes, and which has for its title, *De usu partium in Animalibus, contra Epicurum,* com-

mences with the following words: "Accedamus ad opinionem, quæ in Epicuro tolerari nullatenus possit." P. 682.

The picture of a man, who like Epicurus had cultivated morals, despised religion, and proudly assumed the title of philosopher, is admirably drawn by the pen of Fenelon, representing him as standing before his judges in a future state. *Télémaque*, liv. xviii.

of a different species, or even of a different genus or order, never once thought of transforming a herd, a flock, or a swarm of various kinds of animated beings, into one uniform bulky individual, which was made to feel as if it had only a single life. In animals constructed in this way, by numerous swarms of different species of animated beings, Gassendi could never perceive any thing but a heap of animalcules[k], which, instead of propagating their own species, were propagating a species that did not belong to their genus or order. On the other hand, the hylozoists have been ready to retort, that in animals constructed in his way, by the motions, forms, positions, and magnitudes of inanimate atoms, they have never been able to perceive any thing but a variety of motions and forms, positions and magnitudes, without a single particle of life; while a third class, accustomed to ascribe these operations, directly or indirectly, to the Deity, have been apt to conclude, that if those be fools who have said in their heart there is no God, they are equally fools who admit his existence, but deny the interposition of his providence[l].

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[k] See his answers to the question, "Qui fieri possit, ut res sensilis, sive sensus capax ex insensibilibus gignatur?" Vol. i. p. 508.

[l] Hume, who thinks, or affects to think, that the Deity has delegated a certain degree of his powers to nature, or rather relinquished them entirely in her favour, scruples not to insinuate, that without committing robbery on her and all created beings, he cannot resume them, and is therefore of opinion that

he never has and never will entertain the idea. It being more suitable, as he conceives, to the dignity of the Deity, and his high character for power and wisdom, to dispense with his providence and omnipresence, and entrust the whole charge of creation to nature and her laws, or, in other words, to those servants whom he and his followers have so generously recommended, as in every respect entitled to his confidence. Thus, in allusion to those philosophers who ascribe to the Deity an omnipresence, and a universal superintendence, among whom we find Newton is one, Hume observes, " That according to these philosophers, every thing is full of God. Not content with the principle, that nothing exists but by his will, that nothing possesses any power but by his concession; they *rob nature, and all created beings*, of every power, in order to render their dependence on the Deity still more sensible and immediate. They consider not, that, by this theory, they diminish, instead of magnifying, the grandeur of those attributes which they affect so much to celebrate. It argues surely more power in the Deity to delegate a certain degree of power to inferior creatures, than to produce every thing by his own immediate volition. It argues more wisdom to contrive at first the fabric of the world with such perfect foresight, that, of itself, and by its proper operation, it may serve all the purposes of Providence, than if the great Creator were obliged every moment to adjust its parts, and animate by his breath all the wheels of that stupendous machine." Essays, vol. ii. p. 75.

For the sake of consistency, Hume might have spared this insidious piece of sophistry, and more particularly as in the same essay he labours to demonstrate that no power, inherent or delegated, has ever been observed in what are commonly denominated causes. It might also be asked, Who is this inferior created being that he calls Nature, and whom Newton and others would wish to rob of her powers, her providence and omnipresence, in order to bestow them again upon the Deity? It is upon the gratuitous assumption that the Deity, by his own immediate volition, never interposes to vary or suspend the operations of nature, whether considered as an animated being, or a mere machine, that Hume has presumed to question the credibility of miracles.

SECTION XVI.

OPINIONS OF CUVIER.

CUVIER, who is generally allowed to be the first comparative anatomist of the present age, rejecting the hypotheses of pre-existing germs, indestructible monads, organic particles, and *semina rerum*, as unworthy of notice, has chosen to ascribe the organization of plants and animals, sometimes to what he calls a *vital force*, sometimes to what he calls a *vital impulse*, sometimes to a certain *species of motion*, and sometimes to nothing but to *life itself*[m]. To any but a hasty superficial thinker, or to a person blinded by hypothesis, some distinction between force, impulse, motion and life, would certainly have occurred. To him, however, it has not occurred. He sees not that an impulse, whether proceeding from body or mind, implies something which has a tendency to produce a change; that a force, on the contrary, for instance, the vis inertiæ of matter, or a determined purpose of mind, may be of such a nature as to resist any tendency to change. Besides, he perceives not that a motion occasioned by an impulse or force, in his sense of that word, may be the effect of an impulse or force which does not proceed from a body in motion: thus, when our body is moved by the will, we do not conceive the will to be in motion, nor conceive the motives by which it is actuated, to be moving through space with any momentum, or any supposed degrees of velocity. With respect to life, he thinks not of deciding whether or not it be the cause or effect of motion, and therefore imagines it to be sometimes the one and sometimes the other; and yet he must have seen varieties of motions, simple and compound, which never produced, and never could produce any thing like life; while, on the contrary, it may be presumed that he had never observed and fully ascertained the presence of life in any one body, in which life or the principle of life did not exhibit some phenomena of motion, and not only did exhibit them, but exhibited them always as proceeding from itself, and originating in itself, independently of any thing like external impulse.

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[m] "Ainsi notre propre corps, et plusieurs autres qui ont avec lui des rapports de forme et de structure plus ou moins marqués, paroissant résister pendant un certain temps aux lois qui gouvernent les corps bruts, et même agir sur tout ce qui les environne, d'une manière entièrement contraire à ces lois, nous employons les noms de *vie* et de *force vitale* pour désigner ces exceptions, au moins apparentes, aux lois générales."—*Leçons d'Anatomie Comparée de G. Cuvier*, tom. i. p. 1. Paris, an. viii. v. tom. 8vo.

"Le mouvement *propre aux corps vivans* a donc réellement son origine dans celui de leurs parens; c'est d'eux qu'ils ont reçu *l'impulsion vitale*, et il est évident d'après cela, que, dans l'état actuel des choses, *la vie ne naît que de la vie*, et qu'il n'en existe d'autre que celle qui a été transmise de corps vivans en corps vivans par une succession non interrompue." Ibid. p. 7.

"*Ce mouvement général* et commun de toutes les parties est tellement ce qui fait l'essence de la vie." Ibid. p. 5.

When speaking of the cause of organization under the name of a vital force, Cuvier says it is a force which resists the laws that regulate brute matter, and even acts on surrounding bodies in a manner entirely contrary to those laws. When he speaks of it under the name of an impulse, he thinks it an impulse transmitted from the first parents to all the individuals composing their species, and, consequently, transmitted through successive generations, through numerous ages, and through every country where the species is dispersed[n]. But at what period, or by whom it was given, or through what length of time, or through what extent of space, or to what millions of individuals it is yet to be communicated, he presumes not to conjecture. When speaking of this cause as producing motion, he says the motion is a vortex-like motion[o], and thinks that an animal may be considered as a species of *foyers*, into which dead substances are carried successively, to be there combined in various ways; and where each substance, after occupying a place, and performing a function determined by the species of combinations into which it enters, is to make its escape, and be again subjected to the laws which regulate inanimate nature[p]. As the *foyer*, however, which is here introduced to illustrate the phenomena of an animal structure while growing and living, has not been defined, it may be asked, is it a focus with a power of attraction, by which dead substances are drawn together; or is it a furnace, as one translator chooses to render it[q]; or an eddy, or a whirlpool, as another supposes the author to have meant[r]? One thing is obvious, be it any or all of them, it does not afford the least illustration; for where is the focus, the furnace, the eddy, the whirlpool, or the whirlwind, that lives, grows, organizes and animates, that regularly converts fluids into solids, and solids into fluids, and a second time fluids into solids, to form out of them a complex but definite system of organs? Here there is no simile, and there can be no simile where there are no points of comparison, and no metaphor where there is not the shadow of analogy. The intended illustration is therefore nothing but a heap of words; or, to borrow a term from the language in which the original is written, mere *verbiage*.

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[n] See above, page 318, note m.

[o] "Mouvement de tourbillon." P. 6.

[p] "Ainsi les corps vivans doivent être considérés comme des espèces de foyers, dans lesquels les substances mortes sont portées successivement pour s'y combiner entre elles de diverses manières, pour y tenir une place et y exercer une action déterminée par la nature des combinaisons où elles sont entrées, et

The structure of one animal may serve to illustrate the structure of another, and the life of one animal the life of another; but a thing inorgan-

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pour s'en échapper un jour afin de rentrer sous les lois de la nature morte." Tom. i. p. 5.

[q] The translator of the first and second volumes. London, 1802, 8vo.

[r] See An Introduction to the Study of the Animal Economy, translated from the French of Cuvier, by John Allen. Edinb. 1801, 8vo.

ized can never illustrate organization, nor a thing that is utterly dead or insensible, the cause of either life or sensation. The attempt of Cuvier, therefore, to illustrate the nature of the animal structure, by comparing it to a species of *foyer*, is like the attempts to explain how the stomach causes digestion. "To account for digestion," says Dr. Hunter, "some have made the stomach a mill; some would have it to be a stewing-pot; and some a wort-trough: yet all the while one would have thought that it must have been very evident, that the stomach was neither a mill, nor a stewing-pot, nor a wort-trough, nor any thing but a stomach [s]."

After Cuvier's admission, or rather his assertion, that the laws which regulate living bodies are not only different from those which regulate brute matter, but act in a manner entirely contrary to those laws, we must be surprised at his singular warning, not to consider those two kinds of laws, though entirely contrary the one to the other, as being absolutely of a different order [t].

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[s] Introductory Lectures, p. 95. Lond. 1784, 4to.

[t] "Nous connoissons les charactères chymiques des divers fluides les plus apparens, ainsi que des substances concrètes; nous les décomposons jusqu'à un certain point: mais non seulement cette analyse est très-imparfaite, puisque nous ne pouvons les recomposer; les phénomènes nous apprennent encore qu'il doit exister plusieurs fluides qu'il nous est jusqu'à présent impossible de saisir.

"On auroit donc tort de s'appuyer sur l'inutilité des efforts que les physiciens ont faits jusqu'ici pour lier les phénomènes des corps vivans aux lois générales de la nature, et d'en con-

The truth is, Cuvier, like those physiologists who would have the stomach to be any thing but a stomach, is strangely bewildered amidst the con-

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clure que ces phénomènes sont absolument d'un ordre différent." P. 8.

Dr. Hunter's remarks on this species of philosophy, which appears so much a favourite with Cuvier, are well entitled to considerate attention. "This species of philosophy," says Hunter, "has prevailed in many parts of physiology; and makes up a great part of what has been commonly taught, as sound and useful physiological learning. One thing, of peculiar properties and powers, has been explained by another, of different properties and powers, as absurdly, as if colours had been explained by sounds. Animal functions, generally speaking, are of a peculiar nature; and like nothing which is to be found in the works of art, or wherever there is not animation and life: and, had physiologists spent that time in making accurate observations upon animals themselves, which has been thrown away upon mechanical and chemical visions, by this time we might have understood animal principles and processes better than we now do.

"The capital errors which have prevailed in different ages in the philosophy of human bodies, are the following:

1. "The palpable absurdity of the older anatomists, in describing the structure, and settling the functions of our body, by an examination made on brutes only—now fully exploded.

2. "An absurdity, prevalent with many moderns, that of finding out, and ascertaining the chemical changes produced in our juices, by experiments made on dead matter out of the body.

3. "The third, an error which has been very generally introduced into the writings of the best modern authors, is the drawing conclusions with regard to the *living* body, from experiments made upon the *dead* body. This, in many cases, will be found to be fallacious; and on that account many doctrines and arguments of Kaw Boerhaave, and others, will in a little time be exploded."

fusion of his ideas in labouring to prove that the cause of life may sooner be any thing than what men in general feel and suppose it to be. It is admitted that one genus may differ from another in various particulars, and yet have so many characters in common, as to belong to the same order; but if the two be *entirely* contrary, how is it possible, or how conceivable, that they can belong to the same order? If the laws, then, which regulate living bodies be entirely contrary to the laws which regulate brute matter, can the former be said to be any more exceptions to the latter, than the latter are exceptions to the former? The two indeed may be found to co-operate, but they certainly cannot in classification be arranged under the same order. As well might Cuvier have ventured to maintain that all animals are by nature quadrupeds; and that men, birds, fishes, and insects, vermes and other orders of animals, which have more or fewer than four legs, or have none at all, are but exceptions to the general rule. Yet it is not from ignorance of classification that Cuvier thus confounds laws of so opposite a nature; few can discriminate better than he, when he is not entangled by a hypothesis, but here his hypothesis warps him entirely, and yet seemingly not more so than where he vaguely talks of the motion which was communicated by a vital force

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4. "A similar absurdity, that of explaining the functions of our body, upon mechanical principles; arguing still from *dead* to *living* matter." Hunter's *Introductory Lectures*, p. 95, 96. Lond. 1784, 4to.

or a vital impulse to the first parents of every species.

Can any man who turns his attention to the laws of motion for a single moment, if at that moment he be capable of any attention, really suppose that a body in motion may communicate as much motion to another as it has itself, and yet lose nothing of its own motion; nay, not only communicate it to another, but to millions of others in the same way; and that this motion, in the number of bodies to which it is communicated, should not suffer any sensible diminution from the dispersion, from the quantity of space through which it has to pass, the length of time through which it is continued, or the many resistances which it has to encounter: a motion, too, which in every individual to which it is communicated, may be suspended, renewed, suspended and renewed again, without any additional impulse from a foreign body; a motion which has, in every individual, its periods of increase, of vigour, and decay; which at its commencement can hardly produce a sensible effect on a few particles, not equal in bulk to a grain of sand, and yet in its progress can acquire such energy as to move a horse, an elephant, or a whale, with the utmost facility? Cuvier may reply that here he means, not motion in general, but a vital motion. But what does he mean by a vital motion? Is it a motion produced by animals, or is it a motion by which animals are produced? Here he supposes it to be a motion by which animals are produced. But if it be a motion which produces animals, it ought to have some of the characteristics of motion, and to be subjected to some of the laws which are known to regulate motion in general. But to what laws of motion is it subjected? The thing which organizes an animal body, is in its effects different in different species of animals; and therefore if a motion, there must be as many species of motions as there are species of organized bodies. Newton, who devoted so much of his attention to the laws of motion, never formed an idea of motions like these, which can be communicated only to bodies of particular structures and forms; and which, unlike the motions of the planets, cannot be perpetuated in any single body, but to be perpetuated must be distributed to millions of bodies, and consequently divided into millions of fractions, and in such a manner that each fraction must be equal to the whole of which it is a part. The imaginary motions by which Leucippus, Democritus, and Epicurus, attempted to explain the order of the universe, and the formation of animals and plants, led not to conclusions so extravagantly absurd. They were imagined with more ingenuity, skill, and consistency, were supposed to be eternal, to be the inherent properties of matter, of which every atom was allowed to have its share, and of which no power in the universe could deprive it; yet with the advantages of those motions, and other imaginary properties of atoms, which were certainly better conceived for the purpose than the hypothetical motions of

Cuvier, those philosophers, with all their ingenuity, could never afford an intelligible explanation how either an animal or a plant was formed; and therefore, in their difficulties, which they found to be many, were always reduced to the necessity of having recourse to nature and fate, which they supposed to be every where present, every where active, exercising a constant superintendence; and which, though not endowed with intelligence and foresight, were nevertheless supposed to act as if they possessed them in the very highest possible degree. Cuvier, in ascribing vitality to motion, has confounded the cause and the effect, for the term vital expresses no quality of motion, it merely designates the nature of the cause from which the motion is supposed to proceed. The motions employed in the several processes of organization exhibit no peculiar qualities; but, from the manner in which they are combined, directed, and varied, obviously with a view to an end, we necessarily infer that they operate on a plan which is the result of design and intelligence, and that their cause is something different from gravity or impulse, from elasticity or chemical attraction, a cause which can increase, diminish, and multiply them, suspend, renew, or suspend them again, agreeably to the plan and the change of circumstances.

No wonder that Cuvier, in alluding to his own ideas of life, acknowledges that those ideas are obscure. Admitting a link, by which the phenomena of life are connected, he pretends to know nothing of that link; he only knows that such a link must exist, and although he be entirely ignorant of its nature, he feels confident, notwithstanding his ignorance, that be it what it will, it cannot be what the vulgar suppose it, a particular principle[u]. In this resolution, however, to dissent from the vulgar, he is not always equally determined; as if secretly conscious that his attempts to explain the various phenomena of life and organization by a vital force, a vital impulse, or a vital motion, were not satisfactory even to himself, he observes at times, that life can proceed only from life[x]; even speaks occasionally, like the vulgar themselves, of an internal principle[y]; or, like the evolutionists, sometimes of a germ, which, from the first moments that the fœtus is perceptible by any of the senses, possesses real life, and is the germ of all the phenomena which that life is afterwards to exhibit[z]. To preserve, however, some appearance of consistency, and to make some compensation for these awkward confessions, he maintains that this internal principle is composed of a number of what in other places he describes as its own functions, as digestion, absorption, circulation, respiration, transpiration, and excretions; in other words, he would have it to be a cause which owes its existence to its own operations, and consequently a cause, which, had it not operated to produce itself, had never operated nor existed at all[a]. At other times, indifferent about tracing the phenomena of life and organization to any cause, he appears even more guarded than Blumenbach, and does not presume to trace them to any thing, not even to an occult quality. Unable to arrive, he says, at the first origin of living bodies, we have no resource but to study the forces by which they are connected[b], the common artifice for concealing presumption under the mask of affected modesty, where any apology is thought necessary for not alluding to a first cause.

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[u] "L'idée de la vie est une de ces idées générales et obscures produites en nous par certaines suites de phénomènes, que nous voyons se succéder dans un ordre constant, et se tenir par des rapports mutuels. Quoique nous ignorions la nature du lien qui les unit, nous sentons que ce lien doit exister, et cela nous suffit pour nous les faire désigner par un nom que bientôt le vulgaire regarde comme le signe d'un principe particulier, quoiqu'en effet ce nom ne puisse jamais indiquer que l'ensemble des phénomènes qui ont donné lieu à sa formation." Leçons d'Anatomie Comparée, tom. i. p. 1.

[x] "La vie ne naît que de la vie." Ibid. p. 7.

[y] "Mais les machines animales ont de plus que celles que nous construisons, *un principe intérieur d'entretien et de réparation:* il consiste dans l'ensemble des fonctions qui servent à nourrir le corps, c'est à dire *la digestion, l'absorption, la circulation, la respiration, la transpiration et les excrétions;* elles forment le second ordre, et portent le nom de *fonctions vitales.*" P. 19.

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[z] "En effet, quelque foibles que soient les parties d'un fœtus ou d'une graine dans les premiers instans où il nous est possible de les appercevoir, ils exercent cependant dès lors une véritable vie, et ils ont déja en eux le germe de tous les phénomènes que cette vie doit développer par la suite." P. 6.

[a] See above, note y.

[b] "Ne pouvant donc remonter à la première origine des corps vivans, nous n'avons de ressource pour chercher des lumières sur la vraie nature des forces qui les animent, que dans l'examen de la composition de ces corps, c'est à dire de leur tissu et du mélange de leurs élémens: quoiqu'il soit vrai de dire que ce tissu et ce mélange sont en quelque façon le résultat de l'action des forces vitales qui leur ont donné l'être et qui les ont maintenus, il est clair aussi que ces forces ne peuvent avoir que là leur source et leur fondement." P. 7.

In concluding these remarks on Cuvier's ideas of the nature of life and organization, it may well be said, that, were any person capable of supporting, with any tolerable degree of success, the doctrines of materialism, it would certainly be Cuvier. He is a naturalist, a chemist, mineralogist, a most distinguished and illustrious anatomist, and has probably examined a greater number of organized bodies than any other individual in Europe. His industry, at the same time his learning, his eloquence, and his various talents, are of the first order, except his logical acumen, which seems to have been either originally defective, or to have been afterwards miserably blunted by his hypothesis. It is truly pitiful to think of a man with so many endowments, natural and acquired, driven as if blindfold by the fashion of the times, a contemptible vanity, or some wretched inclination, endeavouring to support with all his energy the extravagant idea that the phenomena of design and intelligence displayed in the form and structure of his species, might have been the effects of some antique force, impulse or motion, or of some group of functions, as digestion, circulation, respiration, transpiration and excretion, which have accidentally happened to meet without any assignable cause to bring them together, to hold them together, or to direct them.

SECTION XVI.

OPINIONS OF LAWRENCE.

Mr. Lawrence, a skilful surgeon, a learned physiologist and distinguished anatomist, in treating of life and organization, has seldom ventured beyond the steps in which Bichât, Blumenbach, and Cuvier have trodden. Like them, he appears decidedly hostile to the idea of a vital principle, resolves to confine his observations entirely to vital properties, and with this resolution, feels no wish "to draw aside the veil from nature to display their essence, and to penetrate to their first causes[c]." "In the study of the physical sciences," he says, "we observe the succession of events, ascertain their series and order, and refer the phenomena ultimately to those general properties or principles, of which the name does not indicate any independent existence, but is to be regarded merely as the generalized expres-

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An Introduction to Comparative Anatomy and Physiology, being the two introductory Lectures delivered at the Royal College of Surgeons, on the 21st and 25th of March, 1816, by William Lawrence, F.R.S. &c. p. 165. London, 1816, 8vo.

sion of the facts[d]." Full of these sentiments, he disapproves highly of those physiologists who "suppose the structure of the body to contain an invisible matter or principle by which it is put in motion." "Such (he says) is the ενορμουν or *impetum faciens* of Hippocrates, the *archeus* of Van Helmont, the *anima* of Stahl, *materia vitæ* of Hunter, the *calidum innatum*, the *vital principle*, the *subtle* and *mobile matter* of others;—there are many names for it, as each successive speculator seems to have fancied that he should establish his own claim to the offspring by baptizing it anew. Either of the names, and either of the explanations may be taken as a sample; they are all equally valuable, and equally illustrative. Most of them indeed have long lain in cold obstruction amongst the rubbish of past ages; and the more modern ones are hastening after their predecessors to the vault of all the Capulets[e]." By this language, his determined hostility to the vital principle is sufficiently evinced. In writing the last words, he seems to have actually embodied it in his fancy, to have thought of its life, its death, and of its grave, though not, we should hope, of the dark night, of the poison, and the dagger, that are said to have been present at the melancholy scene which once took place in the vault of all the Capulets[f]. In speaking of this principle, when his mind appears in a calmer mood, he says, " It is compared to magnetism, to electricity, and to galvanism; or it is roundly stated to be oxygen. 'Tis like a camel, or like a whale, or like what you please[g]." As in every shape, however, it appears to annoy him, it is no wonder, that, like Lucretius, when in horror at religion, he should feel an inclination to trample it under foot, and that to prevent his imagination in future from being haunted by so troublesome a spectre, he should labour to prove that it did not exist. In proceeding to his proofs, he says, " We do not profess to explain *how* the living forces in one case, or attraction in the other, exert their agency[h]." This is said in imitation of Blumenbach, and, he fondly fancies, in imitation of Newton also, who, in showing that the motions of the heavenly bodies follow the same law as the descent of a heavy substance to the earth does, contented himself with explaining the fact[i]. Taking these two authorities for his example, he proposes to trace the phenomena of life and organization no farther than to certain laws, powers, properties, forces, and impulses, which, in imitation of his principal guide Cuvier, he chooses to call vital. " Foiled (he says,) in our attempts to ascend to the origin of organized beings, we seek to inform ourselves concerning the real nature of the powers

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[d] Ibid. p. 148. Mr. Lawrence here borrows from Cuvier. See above, p. 318.

[e] P. 166.

[f] See Shakspeare's Romeo and Juliet, Act V. Scene iii.

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[g] P. 169.

[h] P. 165.

[i] " In shewing that the motions of the heavenly bodies follow the same law as the descent of a heavy substance to the earth does, Newton explained the fact." P. 167.

See Lawrence [illegible]
Page 27
p. 62

See Lawrence Page 144. [illegible] 18

which animate them, by examining their composition, by investigating their texture, and the union of their elements. In them only can the vital impulse have its source and foundation[k]." Had he added, like Cuvier, from whom this passage is literally translated[l], though without any reference, that the texture and union in some measure owe their existence and continuance to the vital forces, or the vital impulse, he might then have inferred, that as they were mutually the source and foundation of one another, there could be no rational motive for tracing them to the origin of organized beings. But ~~Cuvier thinking that also necessary, so does~~ Mr. Lawrence, ~~who,~~ modestly declining either to think or to speak for himself upon the occasion, has no alternative but to follow and obey his master Cuvier who thinks this necessary; and therefore, though his language may appear to proceed directly from himself, it is no more than a literal translation of ~~that passage in which~~ what Cuvier ~~[m] talks of~~ says about the vital germ containing all the vital phenomena to be afterwards developed; of life proceeding only from life, and where he informs us, that the vital impulse said to have its source and foundation in the texture, as the texture had its source and foundation in the impulse, so this impulse is also to be considered as having at times a different origin, and to be an impulse not originating in the texture, but an impulse transmitted from the first parents of every species in an uninterrupted succession. ~~On~~ According to this ~~new~~ hypothesis, bodies are said to grow on bodies similar to themselves, from which they do not separate until they are sufficiently developed to act by their own powers, and which [illegible] ~~when, according to~~ Mr. Lawrence, "they grow by an internal power, and finally perish by that internal principle, or by the effect of life itself, exhibiting in their natural destruction or death, a phenomenon as constant as that of their first production[n]." ([illegible] Page 147) [illegible]

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[k] Ibid. p. 142.

[l] See the original, p. 329 of this Inquiry.

[m] See Cuvier, vol. i. p. 6 and 7, and Mr. Lawrence's Lectures, p. 140, 141, and 142. See also Mr. Lawrence's advertisement, where the want of time, and a desire to print his Lectures as they were, are made the apology for omitting references.

This admission of an internal principle must strike the reader as somewhat remarkable, when that admission is by Mr. Lawrence, who scruples not to ridicule all those physiologists who suppose that any animal structure contains within itself an internal principle that puts it in motion. As he says, however, that on this and all other occasions he will endeavour to convey to his pupils clear notions of the subjects which he proposes for objects of their attention, and that he will carefully explain to them the sense of the terms employed, and avoid all those which have an equivocal meaning; and besides, as he exhorts them to be particularly upon their guard against loose and indefinite expressions, which are the bane of all science, and have been remarkably injurious in the different departments of their own[o], we shall make no apology here for putting this question, What is the meaning which he attaches to *his* internal principle? He has told us, upon the authority of Cuvier, that the vital impulse has its source and foundation in the texture and union of the elements which compose the structure, that life proceeds only from life, and that both life and the vital impulse have been transmitted from our first parents by an uninterrupted succession. On the same authority, he has also told us, that death is the necessary consequence of life itself, or, in other words, of the vital impulse: and, lastly, brings forward Cuvier himself to tell us, that the idea of life is one of those general and obscure notions produced in us by observing a certain series of phenomena possessing mutual relations, and succeeding each other in a certain order: that the vulgar, regarding these phenomena as the sign of a particular principle, have given to that principle a name, though in fact that name can only indicate the assemblage of the phenomena which have occasioned its formation [p]. As to the question, what assembled the phenomena? Mr. Lawrence, before he presumes to reply, has to consult Cuvier, who is unable, however, to solve the difficulty. He only knows that they are assembled, and that they are held together by a link; but he knows as little of the link as of the cause by which they were assembled and bound together. He only knows that such a link must exist; and is certain, though on what grounds he has not informed us, that it is not the link which the vulgar suppose. If Mr. Lawrence dislikes the term link, Cuvier permits him to describe it as a force which, holding the assemblage of phenomena together, enables them to resist the laws of brute matter; or, on certain occasions, to act contrary to those laws; or he may call it a vital germ, containing all the vital phenomena to be afterwards developed; or he may call it an internal principle of support and separation, consisting of its own vital functions, digestion, absorption, circulation, respiration, perspiration, excretion; or, if he prefers his own names, he may call it the force which prevents decomposition, *putredini contrarium*[q]; or the force which binds together the particles of a living body[r]; or the cause which animates and makes all the particles to concur in the production of a common purpose[s]; or, seeing that a living body derives its character from the whole mass, from the assemblage of all the parts, and that even in so simple a creature as the polype, the individuality of the whole animal is quite different from that of its component parts, he may call it the cause of individuality[t]. All these names, or all these expressions, may certainly be used, as, by inference at least, they are warranted by Cuvier; whose only prohibition with respect to this subject is to avoid the idea of the vulgar, a prohibition which has not been observed either by himself or by Mr. Lawrence, who, as we may perceive, have oftener than once, in speaking of the cause of the vital phenomena, been forced to use a language that leads irresistibly to the vulgar idea of a separate principle contained within the structure, and putting it in motion.

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[n] P. 147. See also p. 145, 146.

The idea that death is one of the necessary consequences of life, is, without acknowledgment, also borrowed from Cuvier. Upon the supposition that life is motion, Cuvier infers that it must cease like every other motion which is not in vacuo: "Il paroit même que la vie s'arrête par des causes semblables à celles qui interrompent tous les autres mouvemens connus, et que le durcissement des fibres et l'obstruction des vaisseaux rendroient *la mort une suite nécessaire de la vie,* comme le repos est celle de tout mouvement qui ne se fait pas dans le vide, quand même l'instant n'en seroit pas prévenu par une multitude de causes étrangères au corps vivant." Vol. i. p. 5.

The opposite opinion that life is one of the consequences of death, has obtained the preference with Buffon and Needham, whom we have seen maintaining with the ancients, that the corruption of one body is the generation of another. *Corruptio unius generatio alterius.*

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[o] P. 118.

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[p] See page 122. The original is quoted in the preceding section.

If the assemblage of the vital phenomena forms this principle, as we are told on Cuvier's authority, we have next to ask, what are these phenomena? are they those which Cuvier has chosen to denominate the vital functions, as digestion, circulation, nutrition, and excretion? or those which are said to be the causes of the functions, as the vital forces[u], the living powers[v], the vital properties[x], and the vital impulse[y]? Granting they be either the one or the other, how come they to be called vital? Mr. Lawrence returns no answer, and gives no explanation. He seems not to reflect, any more than Cuvier, that the epithet vital in these cases can only imply, that they are the forces, properties, or powers, of a living being; and that, therefore, in annexing the idea of vitality either to a force, a property, or a power, we must first, though absurdly, suppose it personified, and then view it either as a distinct body or spirit. Of this absurdity, Mr. Lawrence himself on certain occasions seems to be aware, and on these occasions ascribes his living powers and his living properties to living bodies. So far, certainly, he is quite intelligible: but this question follows, How does it happen that his living bodies come to be formed by their own properties? Here he has no answer to give: he even acknowledges, that he has no hesitation in affirming that no connexion has been established in any one case between the organic texture and its vital power[z]; a most singular confession, at least from him. But this leads to another question: If no connexion has been established, how comes he to employ the expression organic texture and *its* vital power? Had he not as good reason for saying the vital power and *its* organic texture? This last expression might however seem to imply that the vital power was the cause of the texture; a supposition which is admitted only when he is accounting for the origin of the texture. In general we are given to understand that the functions are the offspring of the structure, or that the life is the result of the organization; and that the two are consequently connected as cause and effect[a], between which, it would seem, his experience does not warrant any idea of necessary connexion.

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[q] P. 129. [r] P. 136. [s] P. 126. [t] P. 124.

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[u] P. 121. [v] P. 116. [x] P. 120. [y] P. 142.
[z] P. 143.

The word organization now happening to occur, we have next to inquire, what is the idea which he means to convey by the term? Of this term he gives two definitions: the one is, that it denotes the possession of organs, or instruments for accomplishing certain purposes[b]; the other is, that it means that peculiar composition which distinguishes living bodies[c]. If we understand either of the two, Mr. Lawrence means by organization an organized structure. But, in accuracy of language, organization is not a structure, nor is a structure organization. Organization is a general expression for the process or processes by which an organized structure is formed, and therefore can never properly denote the possession of organs or instruments for accomplishing certain purposes, but only a series of operations by which organs or instruments are formed, with a view to accomplish certain purposes. In other words, organization is the means employed in causing the structure, and not an effect produced by the structure.

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[a] P. 115. [b] P. 123. [c] P. 120.

Had Cuvier supposed that the structure either of an animal or plant could have been formed without the previous phenomena of life, he could not with confidence have drawn the conclusion, that the fossil remains of animals and vegetables had once participated in any of the privileges of living beings; for, in opposition to that opinion, it might have been argued upon the hypothesis which was so prevalent in the seventeenth century, that they might as well have been formed by mineral processes in the bowels of the earth[d]. The truth is, organization, in the strict philosophical sense of the word, conveys an idea which is utterly inseparable from that of life being actually present, while the words organism and organized structure do not necessarily convey any such idea; for if organized structures be not immortal, they must die either sooner or later, and all of them be found in the dead state as well as in the living. Mr. Lawrence, however, from confounding organism and organization, speaks almost uniformly of organized structure as existing only in the living state, and then, as usual, copying from Cuvier, describes the nature of those laws which regulate the organized, and of those which regulate what he terms inorganic bodies[e]. From these vague and unsettled ideas of life, he appears also to have been led almost insensibly into the hasty hypothesis of Buffon, on which he asserts with equal confidence, that " the matter which surrounds us is divided into two great classes, living and dead[f]," not reflecting at the time, that by the adoption of this hypothesis, he virtually relinquishes his former distinction, and includes all organized bodies in the dead state under the class of inorganic bodies or brute matter. From another hypothesis, which he has also adopted from Buffon, that dead matter may be made alive, and that living matter may become dead, one should have thought that he might have naturally drawn the inference, that the two epithets living and dead only implied two states of the same matter, and not two distinct classes of matter: nay, it must be allowed, that such an inference had transiently occurred even to himself, where he talks of the vital properties and the vital forces animating living matter, only so long as it continues alive[g]; meaning certainly, if he means any thing, that the vital forces contribute to the life of the living matter, though with all their vitality they cannot ultimately prevent its death[h].

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[d] See above, p. 31.

[e] P. 125, 142.

Even the common term *generation*, conveying a less complex idea than the term organization, is in one instance employed by Mr. Lawrence in such a way as either to convey no meaning or a false meaning. In that passage where he has asserted that all organized bodies are produced by generation, he must have entirely overlooked at the time the manner in which their first parents were produced; or, if he knew nothing of that manner, he might at least have known that their first parents could not have been produced in the way which is usually expressed by the term generation. But, without recourse to first parents, contemplate the numerous tribes of short-lived *animalcula infusoria:* has it ever been proved that they are produced by any process that bears an affinity to generation? Generation, therefore, in this passage, must either be understood in so limited a sense as to exclude immense numbers of organized bodies or in a sense so vague and unlimited as to be unintelligible. In the same sentence he is equally inaccurate, when he asserts that all organized bodies end by death. In making this assertion he proceeds upon his usual supposition, that organized bodies, to continue organized, must continue alive, and cannot exist in a dead state; but granting that all of them must sooner or later be ultimately dissolved, it surely does not follow that they all end by death. No person was ever more capable of informing him than Cuvier, that both animal and vegetable structures have been found organized for hundreds of years, and for longer periods, even after their death; the very desk or the very table on which he wrote the unguarded assertion, might have convinced him that the fact was otherwise. As death, according to his account, is the effect of life itself, it is singular that this question did not occur to him, How comes life to produce its effects upon dead bodies where it does not exist, and where it has ceased for hundreds of years to produce any effects whatever? The answer to such a question must have been, that dead bodies must end or be dissolved by some other cause; and that death, which is only the effect of life, has no concern whatever in the matter.

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[f] P. 121. [g] P. 121.

[h] "We may establish as the general and common characteristics of all organized bodies, that they are produced by generation, that they grow by nutrition, and that they end by death." P. 147.

As to the hypothesis which he appears to have borrowed from Hume, that our experience does not warrant the idea of a necessary connexion between what is termed cause and effect[1], that very hypothesis should have prevented him from admitting, with Cuvier, the necessity of a link for holding the assemblages of phenomena together, and should also have prevented him from ascribing phenomena to any cause which had not, independently of its effects, been known from previous and repeated experience to have existed; for how can he talk with any propriety of a sequence or succession between two events where his experience informs him but of one? Thus, though he may have often felt the effect of the vital impulse, yet did he ever first see the impulse as a separate event, and then its effect as another distinct and separate event following in regular succession? If he ever did, he must certainly at the time have been under the influence of double vision, and imagined that he saw two things when he saw only one.

To the employment of so many words of equivocal meaning, of so many loose and indefinite expressions, and to the adoption of so many hypotheses, groundless, inconsistent, or contradictory, he seems to have been driven, as it were, by necessity, after he had once come to the resolution of opposing every thing that favoured the idea of an internal vital principle; and, therefore, to have been glad to grasp at every shadow that seemed to have but the smallest chance of accounting otherwise for the phenomena which had been ascribed to it: thus, after alluding in honourable terms to Newton's just method of philosophizing, he refuses to draw Newton's conclusion with respect to the cause which gives life, feeling, and motion to animals, without the act of external impulse. Nay, after his acknowledgment that most of the physical sciences afford excellent models for the method of proceeding [k], and after his resolution to follow a method analogous to what is pursued in those sciences [l], he has not hesitated, in another place, to condemn that method as totally inapplicable to organized bodies, which he says should be treated in a manner entirely different from those which have inorganic matter for their object [m]. But, as he is here impelled by the zeal and ardour of an enthusiast who is credulous to excess in believing every thing that affords the least pretence for his opinions, and who has always an excuse for his scepticism, in distrusting even the most powerful evidence which is not in his favour, or for doubting of his own when contrary to his views and his feelings at the moment, the last passage must not be understood as expressive of any permanent opinion, but, like many other passages in the lecture, as expressive only of a momentary opinion arising from some accidental impression, which perhaps he could not trace to its origin. On cooler reflection, where he gives his opinion respecting the distinction between physical and physiological studies, where he keeps in view the sage observations of Dr. William Hunter[n]; and where, asserting his own independence, he bursts the shackles and dissipates the spells in which Cuvier[o], Blumenbach, Buffon, and Bichat, had so closely bound him, he appears like himself, a man capable of patient inquiry, and of acute observation; and presents to us views so just and so important respecting the mode of cultivating physiological science, that, in justice to his talents, in justice to his character, and in justice to the reader, I cannot forbear quoting him here at considerable length. "The application," he says, "of physical science to physiology was begun when the latter was in its infancy; when organization had been little studied, and its phenomena still less observed. The successful employment of the just method of philosophizing, exhibited in the stupendous discoveries of Newton, did not advance the science of life. On the contrary, dazzled by the brilliancy of his progress, physiologists were even led by it into the error of seeking everywhere in the animal economy for *attraction* and *impulse*, and of subjecting all the functions to mathematical calculations[p]. To Haller principally, we must ascribe the merit of placing physiology on its proper basis, as a peculiar and independent science, by his unwearied industry in dissection, and more particularly by his numerous researches in living animals, on all the parts of their vital economy.

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[1] P. 149. See also Hume's Essay of the Idea of Necessary Connexion.

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[k] P. 119. [l] P. 150. [m] P. 160.

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[n] See above, p. 323.

[o] "In several parts of the second lecture the views correspond with those which have been entertained and published on the same subjects by Cuvier and Bichat." *Advertisement.*

" The same means were pursued by Mr. Hunter to a much greater extent, and with superior success. He did not attempt to explain life by barren *a priori* speculations, or by the illusory analogies of other sciences; but he sought to discover its nature in the only way which can possibly lead to any useful and satisfactory result; that is, by a patient examination of the fabric, and a close observation of the actions of living creatures. He surveyed the whole system of organized beings, from plants to man; he developed their structure by numberless dissections, of which the evidences are contained in his collection; and he discovered their functions by patient observation and well contrived experiments. He thus not only strengthened and secured the foundations laid by Haller, but supplied many deficiencies, rectified several inconsistencies, and gave to the whole structure an unity of character and solidity that will ensure its duration[q]." He might have added, that by these means Mr. Hunter was led, as Harvey was before, to the discovery of an internal vital principle. Had Mr. Lawrence only caught a portion of his spirit, or a portion of the spirit of Harvey or Haller, and, in prosecuting physiology, dared to think for himself, regardless of Cuvier's or any other's creed; there are few, perhaps, and there have been few, whose ardour, industry, abilities, learning, and opportunities, would have entitled them to entertain such rational hopes of similar success.

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[p] Mr. Lawrence here forgets his own *vital impulse,* and his resolution to trace phenomena to powers only, as Newton traced the laws of nature to a principle of attraction.

SECTION XVII.

OPINIONS OF CABANIS.

THIS author, who has written a work[r] in two volumes concerning the relations that have been observed between the moral and physical part of the nature of man, seems anxious to prove that the moral part has its origin in the physical; that all our ideas may be traced to sensation or to sensibility, and that sensation and sensibility can be traced no farther than to the organic structure and its functions. By following, he says, the nature of man up to its source; by studying the laws of his organization[s], and observing the phenomena proceeding directly from his sensibility, we clearly perceive how much the moral part of his nature is essential to his wants[t]; for as he has wants, so has he also faculties to satisfy them; faculties however, which, as well as his wants, are dependent immediately on his organization[u]. It may therefore be presumed, in his opinion, that the operations of intelligence and the will, are, at their origin, confounded with the rest of the vital motions; that the principle of all the moral sciences, and consequently these sciences themselves, are under the dominion of physical laws, and their history nothing more than a branch of the natural history of man[x]. If some persons, as he has been assured, have expressed apprehensions that his intention in supporting such opinions is to overturn certain doctrines, and to establish others in their stead, with respect to first causes, he solemnly declares that the thing is impossible, and cannot believe that they seriously entertain any such ideas; considering that the causes to which they allude are placed beyond the sphere of our research, can never be the objects either of examination or doubt, and that consequently any rational inquiry concerning them would terminate only in insuperable ignorance[y]. He observes, in conformity with these sentiments, that since the period in which a line of separation was drawn between the study of man as a physical agent, and the study of man as a moral agent, the principles relating to the latter study have been necessarily obscured by a number of vague metaphysical hypotheses[*].

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[q] P. 161, 162, 163.

[r] Rapports du Physique et du Moral de l'Homme, par P. J. G. Cabanis, membre du Sénat, de l'Institut national; de l'Ecole et Société de Médecine de Paris, de la Société philosophique de Philadelphie, &c.

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[s] This author, like most materialists, regularly confounds organization and organic structure, substituting the cause for the effect.

[t] "C'est sur-tout en remontant à la nature de l'homme; c'est en étudiant les lois de son organisation, et les phénomènes directs de sa sensibilité, qu'on voit clairement, combien la morale est une partie essentielle de ses besoins." *Rapports du Physique et du Moral de l'Homme*, préface, p. 32, 2d edit. Paris, 1805, 2 tom. 8vo.

[u] "L'homme a des besoins: il a reçu des facultés pour les satisfaire; et les uns et les autres dépendent immédiatement de son organisation." Ibid. p. 7.

[x] "En supposant qu'il nous fût permis de répondre par l'affirmative aux diverses questions énoncées ci-dessus, les opérations de l'intelligence et de la volonté se trouveroient confondues, à leur origine, avec les autres mouvemens vitaux: le principe des sciences morales, et par conséquent ces sciences elles-mêmes, rentreroient dans le domaine de la physique; elles ne seroient plus qu'une branche de l'histoire naturelle de l'homme." Ibid. p. 21.

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[y] “Quelques personnes ont paru craindre, à ce qu'on m'assure, que cet ouvrage n'eût pour but, ou pour effet, de renverser certaines doctrines, et d'en établir d'autres relativement à la nature des causes premières. Mais cela ne peut pas être: et même, avec de la réflexion et de la bonne-foi, il n'est pas possible de le croire sérieusement. Le lecteur verra souvent, dans le cours de l'ouvrage, que nous regardons ces causes comme placées hors de la sphère de nos recherches, et comme dérobées, pour toujours, aux moyens d'investigation que l'homme a reçus avec la vie. Nous en faisons ici, la déclaration la plus formelle: et s'il y avoit quelque chose à dire encore sur des questions qui n'ont jamais été agitées impunément, rien ne seroit plus facile que de prouver qu'elles ne peuvent être ni un objet d'examen, ni même un sujet de doute, et que l'ignorance la plus invincible est le seul résultat auquel nous conduise, à leur égard, le sage emploi de la raison.” Préface, p. 38, 39.

He might have added, and with equal justice, that it is likewise, since that period when man first began to be studied only as a physical agent, there have been more gratuitous assumptions, many more mechanical visions, and much more unintelligible nonsense, about the occult qualities of matter and its unknown chemical affinities, than were ever before introduced into systems of physiology. On the least reflection, it is obvious that man is not only a physical but a moral being; that his physical and moral nature are conjoined, but not confounded; and though closely connected, and observed mutually to affect one another, are, notwithstanding, each regulated by peculiar laws, and not absolutely dependent on one another. Cabanis's object is, however, to remove this line of separation; to destroy every vestige of distinction; to show that man is, in all respects, a physical agent; that all his actions are regulated entirely by physical laws, and that all his powers, intellectual and moral, must ultimately be traced to organic structure. To enhance the credit of such a hypothesis, he intimates that Locke was the first who clearly saw its importance, although it had been partly foreseen by other philosophers, endowed probably with greater genius, as Aristotle, Democritus, Epicurus, Bacon, and Hobbes [a]. According to him, Democritus was the first who dared to conceive a system of the world founded upon the properties of matter and the laws of motion; a system which Epicurus afterwards adopted, and more fully developed, being partial to it, chiefly upon the account that he found it freed from all the embarrassing absurdities of theogonies or hypotheses concerning creations by a deity [b]. But, on what pretence are these two philosophers introduced with others who differ so very widely from both in their choice of *data*, and in their modes of investigation? Is it on the supposition that they were all equally attached to experiments? Democritus certainly, in conceiving his mechanical system of the world, had no encouragement either from experiment or observation. It is acknowledged upon all hands, that he never saw his ultimate atoms, which were totally beyond the reach of his senses; and consequently the properties which he ascribed to them must have been hypothetical. He supposed, besides, that their motion was eternal, and that they moved by no law but that of deviating constantly and eternally from a straight line, even when in vacuum. Had this law of his the slightest resemblance to the laws of motion discovered by Newton? or did he draw Newton's conclusion, that " the first cause certainly is not mechanical?" It is not to be denied, if we can rely on the authenticity and accuracy of the letter which Hippocrates, after visiting Abdera, is said to have written to his friend Damagetus, that Democritus expended much of his time in making experiments by dissecting animals; not however, as Cabanis with the utmost effrontery presumes to assert, in dissecting their brains, to unveil the mysteries of physical sensibility, or to discover the organs and causes which produce thought[c]: in that letter there is no allusion whatever to these subjects. If we can confidently rely on the statement which is there given, the sole object of Democritus's dissections was to find out the seat and nature of the bile, which he conceived to be somehow or other the cause of madness[d]. Granting even that Epicurus, as well as Democritus, spent much of his time in making experiments; yet, who had not then, and who has not still recourse to such expedients, when he wishes to establish any favourite hypothesis? Admitting that they made thousands of experiments, will it be asserted that their object or mode of experimenting had any affinity to the object or mode of experimenting recommended by Bacon? Bacon had ~~seen that~~ experiments in general, when improperly conducted, or performed with a view to support idly preconceived hypotheses, ~~were~~ worse than no experiments at all. It was not therefore experiments in general which he recommended, but experiments performed according to the rules, and agreeably to the plan which he has described. It would reflect little honour upon Bacon merely to say that he recommended experimental philosophy, and by his influ-

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[*] "Depuis qu'on a jugé convenable de tracer une ligne de séparation entre l'étude de l'homme physique, et celle de l'homme moral, les principes relatifs à cette dernière étude, se sont trouvés nécessairement obscurcis par le vague des hypothèses métaphysiques." Ibid. p. 12.

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[a] " Déja cependant, quelques hommes, doués de plus de génie peut-être que ce respectable philosophe, [Locke,] avoient entrevu les vérités fondamentales exposées dans ses écrits. On en retrouve des vestiges dans la philosophie d'Aristote, et dans celle de Démocrite, dont Epicure fut le restaurateur. L'immortel Bacon avoit découvert, ou pressenti presque tout ce que pouvoit exiger la refonte totale, non-seulement de la science, mais, suivant son expression, de *l'entendement humain* lui-même. Hobbes sur-tout, par la seule précision de son langage, fut conduit, sans détour, à la véritable origine de nos connoissances. Il en trace les méthodes avec sagesse; il en fixe les limites avec sûreté. Mais ce n'étoit point de lui, c'étoit de Locke, son successeur, que la plus grande et la plus utile révolution de la philosophie devoit recevoir la première impulsion. C'étoit par Locke, que devoit, pour la première fois, être exposé clairement et fortifié de ses preuves les plus directes, cet axiome fondamental: *que toutes les idées viennent par les sens, ou sont le produit des sensations.*" Préface, p. 14, 15.

[b] " C'est lui [Démocrite] qui le premier osa concevoir un système mécanique du monde, fondé sur les propriétés de la matière et sur les lois du mouvement; système adopté dans la suite et développé par Epicure, et qui, par cela seul qu'il se trouvoit débarrassé de l'absurdité des théogonies, avoit conduit, comme par la main, ses sectateurs à ne chercher les principes de la morale que dans les facultés de l'homme et dans les rapports des individus entre eux." P. 19.

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[c] " Hippocrate, appelé par les Abdéritains, pour guérir Démocrite de sa prétendue folie, le trouva disséquant *des cerveaux*.

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d'animaux, dans lesquels il s'efforçoit de démêler les mystères de la sensibilité physique, et de reconnoître les organes et les causes qui produisent la pensée." P. 21.

[d] "Τουτου μεν τοι γε ανατεμνω εινεκα, ου μισεων θεου εργα, χολης δε διζημενος φυσιν και θεσιν· οιδα γαρ, ανθρωπων παρακοπης ως αιτιη επιτοπολυ αυτη πλεονασασα." Hippocratis Opera Omnia, tom. ii. p. 917. edit. Joannis Anton. Vander Linden. Lugd. Bat. 1665, 2 tom. 8vo.

ence raised it to a higher degree of estimation than any of his predecessors. The causes which have shed ~~such~~ bright a lustre on his name were his just, enlarged, comprehensive views of the various objects of philosophical investigation: and, above all, his important discovery of the true art of experimenting and philosophizing; that art of arts which by due application is calculated to improve all other arts, to distinguish false sciences from the true, to direct our reasonings, to warrant our conclusions, and to cause our knowledge, so far as it extends with respect to the physical and moral world, to rest on a solid and permanent foundation. Experiments conducted agreeably to the mode which he has recommended, can only have for their object the discovery of truth; whereas experiments conducted upon the principles, and agreeably to the mode pursued by Democritus and Epicurus, with a view to confirm preconceived hypotheses, are often nothing more than so many visionary pillars erected to support errors and absurdities.

It is with more seeming propriety that Hobbes is introduced along with Democritus and Epicurus; a philosopher who, though of a penetrating mind and of deep reflection, has however, from his habits, his inclinations, and the circumstances of the times, been disposed like them to disregard moral distinctions, and to trace phenomena to physical causes. In consequence of this he was led to infer, that kings are entitled to tyrannize over their people; and from the same data Cabanis infers, that the people are entitled to tyrannize over their sovereigns. I shall not inquire which of the two has reasoned most accurately, being fully convinced that their premises are of latitude sufficient to admit equally of either conclusion. Cabanis has lamented Hobbes's infatuation: Hobbes would probably have lamented Cabanis's, yet both seem to have been equally infatuated, and for such infatuation there is some apology in the nature of man; for, let the feelings and prejudices of the heart be what they will, if they be powerful, the head generally adopts its suggestions; and if these suggestions be defensible at all, will defend them with all the logic and sophistry of which it is capable.

With respect to Aristotle, considering the time in which he lived, and the great extent and variety of knowledge which he acquired, I am as much disposed as Cabanis to estimate highly the merits of that extraordinary man; but Aristotle was of too comprehensive a mind, too well informed, and of too much metaphysical acumen, not to perceive that something totally distinct from the elements, and any of their properties, whether separate or combined, was necessary to account for the cause of motion and organization. In treating of the soul, he does not appear even to have dreamed that all its phenomena might ultimately be traced to what are denominated physical causes. This idea, to its full extent, according to Cabanis, first occurred to Locke, who, disregarding the fanciful distinction between the moral and physical part of the nature of man, succeeded in giving an effectual impulse to a new and important revolution in philosophy, by establishing on clear and direct proofs, that all our ideas are derived from the senses, or are the productions of our sensations. Now, whether this statement be the effect of misguided ignorance or of mere effrontery, I shall not inquire: I would only ask, is it true or false that Locke ever established, or ever intended to establish, such an axiom? If we can rely on the words of Locke, and on his sincerity, we may venture to assert that the statement is false. He says, indeed, that all our ideas are derived either from sensation or reflection, but sensation and reflection, in his language, are two words of a different import. They denote distinct fountains of ideas. "*Our senses*," he observes, "conversant about particular sensible objects, do *convey into the mind* several distinct *perceptions* of things, according to those various ways, wherein those objects do affect them: and thus we come by those ideas we have of *yellow*, *white*, *heat*, *cold*, *soft*, *hard*, *bitter*, *sweet*, and all those which we call sensible qualities; which, when I say the senses convey into the mind, I mean, they from external objects convey into the mind what produces there those *perceptions*. This great source of most of the *ideas* we have, depending wholly upon our senses, and derived by them to the understanding, I call Sensation.

"The other fountain, from which experience furnisheth the understanding with *ideas*, is the *per*-

ception of the operations of our own minds within us, as it is employ'd about the *ideas* it has got; which operations, when the soul comes to reflect on, and consider, do furnish the understanding with another set of *ideas,* which could not be had from things without; and such are *perception, thinking, doubting, believing, reasoning, knowing, willing,* and all the different actings of our own minds, which we, being conscious of, and observing in ourselves, do from these receive into our understandings as distinct *ideas,* as we do from bodies affecting our senses. This source of *ideas,* every man has wholly in himself: and tho' it be not sense, as having nothing to do with external objects, yet it is very like it, and might, properly enough, be called internal sense. But, as I call the other Sensation, so I call this Reflection; the ideas it affords being such only as the mind gets by reflecting on its own operations within itself[e]."

In treating of the opinions of Locke, it ought to be always carefully remembered, that, although he says reflection may be called an internal sense, he by no means intends that it should be confounded with any of the five external senses. According to him, it is a sense of the mind only, not of the body; and consequently has not, like the bodily senses, any thing to do with external objects. With what confidence then are we to rely either on the accuracy or veracity of Cabanis, who thus imputes opinions to Locke which he never held, and who, falsifying the letter of Hippocrates to Damagetus, imputes to Democritus a course of studies of which that philosopher seems never to have dreamed? Had Cabanis studied Locke, comprehended his meaning, and possessed the candour to represent him fairly and honestly, he would rather have said that Locke was the first, or among the first, who fully exposed the falsehood of that old scholastic maxim, *Nihil est in intellectu quod non fuit prius in sensu*[f].

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[e] Essay concerning Human Understanding, vol. i. p. 68. edit. Lond. 1748, 2 vols. 8vo.

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[f] It can be no excuse to Cabanis that he is not master of the English language, as there are more editions than one of a very excellent French translation of the fourth edition of the Essay concerning Human Understanding, by the author's particular friend, M. Coste; a translation executed under Locke's own eye, and approved by himself. Cabanis, however, apparently more anxious that his hypothesis should be believed than that it should be true, is not content, like some of his countrymen, with ascribing this scholastic maxim to Locke, but, conscious of the value of Locke's name in procuring it a reception with the ignorant and unthinking, ventures to assert that Locke was the first who established its truth by demonstrative evidence. With a similar intention, with equal assurance, and with a like deficiency of proof, he maintains that this celebrated maxim is now adopted by what he calls the school of modern analysts. "Le mot si répété par l'école des analystes modernes, *il n'y a rien dans l'esprit qui n'ait passé par les sens*, est célèbre sans doute à juste titre: l'exactitude et la briéveté de l'expression n'en sont pas moins remarquables que l'idée elle-même, et l'époque dont elle date." (Tom. i. p. 30.)—Nay, he even goes farther, and in total defiance of decency and shame, presumes to assert, that the truth of this maxim has been acknowledged by the whole philosophers of the Scotish school;

But granting here, for the sake of argument, that the maxim were true, that all our ideas, intellectual and moral, are derived from sensation, and

and that, in conformity to this maxim, they account for all moral relations. " La sympathie morale offre encore des effets bien dignes de remarque... Ces effets, et beaucoup d'autres qui s'y rapportent, ont été l'objet d'une analyse très-fine: la philosophie écossaise les considère comme le principe de toutes les relations morales." (Tom. i. Préf. p. 19, 20.)—Now, without intending in any respect to detract from the character of the celebrated author of the Wealth of Nations, or meaning to insinuate that his Theory of Moral Sentiments has any tendency to favour the hypothesis, that all our ideas are derived from sensation, I shall take the liberty of giving an extract from a philosopher of the same country, who, justly celebrated and highly esteemed as Dr. Smith is, is not his inferior either in learning or in reputation. The extract will show that one of the most distinguished philosophers of the present day, and generally acknowledged to be now at the head of the Scotish school, seems to entertain no such maxim as that which Cabanis appears anxious to impute to the Scotish philosophers in general. " It is worthy of remark," says Mr. Stewart, " that the argument employed by Gassendi against Descartes, is copied almost *verbatim* from his own version of the account given by *Diogenes Laertius*, of the sources of our knowledge, according to the principles of the Epicurean philosophy ;—so very little is there of novelty in the consequences deduced by modern materialists from the scholastic proposition, *Nihil est in intellectu quod non fuit prius in sensu.* The same doctrine is very concisely and explicitly stated in a maxim formerly quoted from Montaigne, that ' the senses are the *beginning* and *end* of all our knowledge ;'—a maxim which Montaigne learned from his oracle Raymond de Sebonde; which, by the present race of French philosophers, is almost universally supposed to be sanctioned by the authority of Locke ;—and which, if true, would at once cut up by the roots, not only all metaphysics, but all ethics, and all religion, both natural and revealed. It is accordingly with this very maxim that Madame du Deffand (in a letter that all our sensations owe their existence to organic structure, would it necessarily follow that, from such a concession, Cabanis might be able to cut up by the roots, not only all metaphysics, but all ethics, and all religion, both natural and revealed?—the irresistible inference, thinks Mr. Stewart, if it be admitted that the senses are the beginning and end of all our knowledge. Now, although it is with diffidence, as with diffidence it ought to be, that I differ from one so eminently qualified to decide on such matters; from one who, considering what is peculiarly and unquestionably his own, can derive but little additional reputation from being of the number of Reid's select friends, and even one of the two whom that eminent philosopher condescended to consult on subjects of profound philosophical inquiry; yet I must confess I differ from him

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which rivals any thing that the fancy of Moliere has conceived in his *Femmes Savantes*) assails Voltaire for his imbecility in attempting a reply to an atheistical book then recently published. In justice to this celebrated lady, I shall transcribe part of it in her own words, as a precious and authentic document of the philosophical tone affected by the higher orders in France, during the reign of Louis XV.

'J'entends parler d'une réfutation d'un certain livre, (*Systême de la Nature.*) Je voudrois l'avoir. Je m'en tiens à connoître ce livre par vous. Toutes réfutations de systême doivent être bonnes, surtout quand c'est vous qui les faites. Mais, mon cher Voltaire, ne vous ennuyez-vous pas de tous les raisonnemens métaphysiques sur les matières inintelligibles. Peut-on donner des idées, ou peut-on en admettre d'autres que celles que nous reçevons par nos sens?'—" If the senses be the beginning and end of all our knowledge, the inference here pointed at is quite irresistible." Stewart's *Dissertation on the Progress of Metaphysical, Ethical, and Political Philosophy*, p. 109.

here. Suppose, for instance, that I entertain certain ideas of the providence of God, and of a future state of rewards and punishments, does not Lucretius, one of the most able and strenuous defenders of Epicurus, and an open contemner of all such ideas, readily admit that such ideas are not only common, but even universal among mankind? Then whence, I would ask, have I and others acquired such ideas? The question is not, whether such ideas be true or false, but whether or not have they an existence? If they have an existence, which is not disputed either by Cabanis or any of his friends, whence have they derived that existence? If Cabanis adhere to his hypothesis, he must say, from sensation; but as sensation, upon his hypothesis, derives its existence from organic structure, he must ultimately trace them through the medium of sensation to organic structure; and as organic structure, upon the hypothesis, is regulated entirely by physical laws, it must follow that these physical laws, in the human constitution, produce sensations which excite ideas both of a deity and a future state; and as these ideas, upon the hypothesis, are the natural and necessary result of the physical laws of organic structure, the organic structure, in acting under its physical laws, must necessarily compel us not only to be moral but religious beings. On the other hand, should it be asserted, or even demonstrated, that no such ideas are derived from sensation, it will only prove, upon the admission that such ideas actually exist, that they must necessarily derive their existence from some other source; and that, consequently, the maxim which avers that the senses are the beginning and end of all our knowledge is utterly false, and never has a semblance of truth but when applied to the brutes that are destitute of reflection. If Cabanis had wished to be numbered with these after his death, he should have brought himself down to their level, renounced all ideas from reflection, imitated their simple manners and habits, foregone all thoughts of ambition, demonstrated himself to be one of the beings belonging to their class, and then laid claim to their envied privileges in a future state.

This favourite theory, so common with most materialists and sensualists, concerning the origin of our ideas, seems rather to have sprung from some interested feelings of the heart, than from any deep cogitations of the head. Besides, the heart in doubt and anxiety, being eager to grasp at whatever affords it a ray of hope, is not very scrupulous about the strength or solidity of the arguments that gratify its wishes. Content often with a semblance of reasoning, Cabanis, to convince us of the truth of his hypothesis, appeals to physiognomy[g], a science which, if it may be called a science, would induce us to believe that the body is every thing, and the spirit within it its property and its slave. Such a science, with strong natural propensities in its favour, requires the recommendation of but little art, and very little argument. The superstitious credulity of mankind is always ready to welcome and embrace it, not only in opposition to reason, but in opposition to the numerous facts which belie its predictions. Its fascinating influence upon the heart, and its power to set all reasoning at defiance, are singularly evinced in a treatise which has been ascribed to Aristotle[h], in the physiognomy of Baptista Porta[i], in the Metoposcopy of the learned Cardan[k], and in the Metoposcopy and Cheiromancy of Richard Saunders[l]. When accompanied or combined with judicial astrology, it is impossible to assign any limits to its pretensions. Cardan and Saunders seem to have believed that the wrinkles on the face, the lines on the hands, and the moles on the skin, when properly understood, are sufficient to predict the whole circumstances of a man's future life, whether it is to be adverse or prosperous, long or short; whether it is to end by a violent or a natural death; at home, abroad, by land, or at sea; in the bed, in the field, or upon the scaffold; nay, sufficient to predict a variety of other additional circumstances respecting his friends, his wife, his offspring, and his other relatives. In short, the pretensions of this juggling science are never in proportion to the strength of the arguments by which it is supported, but rather in proportion to the general ignorance and credulity of the times, the general folly with which it is admired, and the powerful influence of that eager desire of mankind in general to pry into futurity, and to know its decisions upon every silly trifle in which they are concerned.—As knowledge increases, the confidence in its predictions diminishes; and on that account it now appears with a less assuming aspect than in the days of Cardan and Saunders. Its abettors now, to acquire any credit for their skill in prophesying, are compelled to assign something like argument, to qualify their assertions with more caution, and to furnish themselves with a much greater variety of subterfuges and ingenious excuses, in cases where they dread that their predictions may not be verified.

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[g] "Les anciens, dis-je, avoient remarqué qu'à telles apparences extérieures, c'est à dire, à telle physionomie, taille, proportion des membres, couleur de la peau, habitude du corps, état des vaisseaux sanguins, correspondoient assez constamment telles dispositions de l'esprit, ou telles passions particulières. Je me borne aux traits principaux, me réservant de traiter ailleurs ce sujet plus en détail, et d'après des considérations qui me paroissent plus exactes." P. 45.

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[h] See Φυσιογνωμονικα: Aristotelis Opera Omnia, tom. i. p. 1169. edit. Lutetiæ, 1629, 2 tom. fol.

[i] La Fisonomia dell' Huomo et la Celeste. Ven. 1652, 8vo.

[k] La Métoposcopie de H. Cardan. Paris, 1658, fol.

[l] Physiognomie and Cheromancy, Metoposcopie, &c. London, 1671, fol.

In making these remarks, I mean not to deny that there are many external appearances in the form of the body, in its proportions, motions, and attitudes, by which we are led, partly by instinct, and partly by previous associations founded on experience, at once to form some idea of the health, temper, dispositions, manners, and habits, of an individual. I object only to the pretensions that we are capable of forming any correct idea of a man's private or peculiar character from these alone, without knowing something of his actions, of his previous education, of the opinions or prejudices which he may have imbibed, or of those arts which he may have acquired in counterfeiting various outward expressions, that bespeak neither the feelings of his heart nor the thoughts of his head. What Bacon calls the *idola tribus*, the *idola fori*, and *idola theatri*, can have no signature impressed upon the structure, which may not be obliterated by contrary views, manners, and habits.

The absurd attempt to judge of the whole of a man's character, by looking merely at a part of his body, his hands, or his head, and in that way to limit inquiry, to furnish a scope for idle conjecture, and to be the more confident, the more that the grounds of information are narrowed, has been so invariably the uniform practice with physiognomists in all ages, that the word physiognomy, in most languages, now merely denotes a species of fortune telling. When the mind has once caught the infection, and is hurried along by this strange propensity to look for the signs of futurity in every thing, there is scarcely a single feature of the face, of the head, or of the neck, in which the fancy may not trace some resemblance between it and similar parts of the lower animals, or between it and similar parts of other individuals of the same species, and from which it will not immediately infer, to a certain extent, a similarity of dispositions, genius, and habits. Now, although physiognomists in such cases might, if they chose, vindicate the principles on which they proceed, by appealing to the treatise ascribed to Aristotle, and to other celebrated works upon the subject, yet, as it was their custom in the days of the learned Cornelius Agrippa, to appeal rather to their own experience[m], so that practice has been continued; this kind of experience being generally found the best calculated to bend and accommodate itself to the theories of those who appeal to it. And hence it is, that in appealing to such an experience, the physiognomist, although mistaken, may be sincere, when he informs us, that in all his predictions he has scarcely been deceived in a single instance: a report, however, which is not to be very hastily credited, considering that the most eminent physicians, after studying the history of a disease in various authors, after frequently observing it in their own practice, after trying to illustrate the nature of its symptoms by various dissections, and after the most unremitting attention to its remote and proximate causes, during a long professional life, have, notwithstanding, been unable to form in particular cases a decided prognosis, either with respect to its continuance or its mode of termination: so that many have lived, who by their prognosis ought to have died, and many have died, who by their prognosis ought to have lived.

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[m] Agrippa de Incertitudine et Vanitate Omnium Scientiarum et Artium, p. 81. edit. Lugd. Bat. 1643, 12mo.

Cabanis, a physician himself, appears not totally insensible of the danger to which he is exposed, when, with a view to collect arguments in support of his hypothesis, he enters on the slippery ground of physiognomy. As a precedent and vindication of his conduct, he mentions a number of vital phenomena, which the ancients were accustomed to ascribe to the influence of their four temperaments, the sanguineous, the phlegmatic, the bilious, and the melancholic; gives an account of the different species or modifications of feeling and passion which each of them indicated; confesses, at the same time, that the black bile[n], from which the fourth temperature is denominated, has been found to be a fiction, and that the ancients, by entering too minutely into detail concerning the phenomena of their four humours, lost themselves in visions[o]. He mentions these opinions of the ancients to show that they, as well as the moderns, had frequently observed how much the nature of the several passions, affections, and thoughts, was dependent upon the state of the body; yet, without ascribing that influence to the humours, as was the general practice with the ancients, he is rather inclined to join with the moderns, and to ascribe it entirely to the solids, principally to the brain, the spinal marrow, and the nerves that issue from them; though to no system of solids exclusively, as that influence is sometimes found to proceed from the muscles, sometimes from the abdominal viscera, in short, from the organs or the systems of organs where the sensibility predominates at the time. Be it however owing to the solids or to the fluids, or to both together, there can be no rational objection to this general conclusion, that the body modifies the vital phenomena. It is only when he presumes to assert, that the body not only modifies, but is really the cause of these phenomena[p], that I would be disposed to enter my dissent, and to deny that such a conclusion is warranted by his premises or by any observation which he has made.

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[n] Μελαινη χολη.

[o] " Mais il faut convenir qu'en quittant les généralités, les anciens se sont ici perdus dans des visions." P. 56.

Suppose that, agreeably to a hypothesis not only of Robinet, but of other philosophers, there are two worlds, a visible and an invisible, and that there are many species of beings belonging to the latter, which, endowed with the power of organizing matter, form to themselves specific structures adapted to their several capacities and energies; would it not follow, on this supposition, that these beings, in constructing their systems of material organs, or in employing these organs afterwards, would at least be regulated by some laws peculiarly their own, and exhibit phenomena, through the medium of such organs, which could not with any propriety be ascribed to any of the substances composing the material or visible world? Considering, besides, that those systems of material organs would still be subjected to the general laws of the visible world, would there not necessarily be a reaction between those systems and the invisible beings within them? and until the relation between them should be dissolved, would not the systems continue subjected to two distinct species of laws at the same time; one species peculiar to the invisible beings acting from within; and another species peculiar to the visible or material world acting from without? Now, that there is some invisible agent in every living organized system, seems to be an inference to which we are led almost irresistibly. When we see an animal starting from its sleep, contrary to the known laws of gravitation, without an external or elastic impulse, without the appearance of electricity, galvanism, magnetism, or chemical attraction; when we see it afterwards moving its limbs in various directions, with different degrees of force and velocity, sometimes suspending and sometimes renewing the same motions, at the sound of a word or the sight of a shadow, can we refrain a moment from thinking that the cause of these phenomena is internal, that it is something different from the body, and that the several bodily organs are nothing more than the mere instruments which it employs in its operations? not instruments indeed that can be manufactured, purchased, or exchanged, or that can at pleasure be varied in form, position, number, proportion, or magnitude; not instruments whose motions are dependent upon an external impulse, on gravity, elasticity, magnetism, galvanism, on electricity or chemical attraction; but instruments of a peculiar nature, instruments that grow, that are moved by the will, and which can be regulated and kept in repair by no agent but the one for which they were primarily destined; instruments so closely related to that agent, that they cannot be injured, handled, or breathed upon, approached by cold, by wind or by rain, without exciting in it certain sensations of pleasure or of pain; sensations which, if either unusual or excessive, are generally accompanied with joy or grief, hopes or alarms: instruments, in short, that exert so constant and powerful a reaction on the agent that employs them, that they modify almost every phenomenon which it exhibits, and to such an extent, that no person can confidently say what would be the effect of its energies if deprived of instruments; or what would be the effect of its energies, if furnished with instruments of a different species, or if furnished with instruments of different materials, less dependent on external circumstances, and less subjected to the laws of gross and inert matter. That logician therefore, that moralist, that divine, or that metaphysician, who overlooks the reaction of the organs, and proceeds to treat of the animating principle, as a thing unbodied, or at least not encumbered with material organs, is guilty of as unwarrantable an assumption, as that anatomist, surgeon or physician, who, considering only the reaction of the organs, most illogically concludes that they not only modify the energies of the animating principle, but are even the causes of its existence.

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[p] "Il est donc certain que la connoissance de l'organisation humaine et des modifications que le tempérament, l'âge, le sexe, le climat, les maladies, peuvent apporter dans les dispositions physiques, éclaircit singulièrement *la formation des ideés.*" P. 71.

Could Dr. Spurzheim, Sir George Mackenzie, and Mr. Combe, who are men of learning, observation, and candour, succeed in convincing other philosophers of this constant reaction of the organs on the animating principle; and could they distinguish in its phenomena to what extent its energies are modified by the state of the organism through which these phenomena are displayed, they would undoubtedly perform an essential service to philosophy in general, and correct many errors in moral and metaphysical reasoning. Independently altogether of the supposition that each species of animating principle constructs for itself a system of organs suited to its several wants and capacities, it cannot be denied, that in every species of the animal kingdom, the external form, the strength, the motions, and the proportions, are admirably adapted to the dispositions and instincts within. No man can survey the lion, observe his form, his muscular strength, his jaws, his teeth, his powerful limbs, and the length of his claws, without a sudden and instinctive feeling that he is a courageous and carnivorous animal. At the same time, by proceeding always upon the hypothesis that the external form and structure uniformly indicate the dispositions, we in many instances may be grossly deceived. Thus, who, from the structure, external or internal, would ever anticipate the different dispositions of the hare and the rabbit, or the different dispositions of the garrulous rook and the carrion crow? Natural history supplies us with almost innumerable instances of habits and instincts, not only of a different but opposite nature, which are displayed through the medium of similar forms and of similar structures; a proof certainly that animating principles of a different species may employ similarly constructed systems for widely different and opposite purposes.

Voluntary organs, or organs formed to obey the will, are not restricted to any specific modes of operation. The human hand is not limited to acts of beneficence or to acts of cruelty; it is equally subservient to all the instincts, appetites and passions; equally obedient to all who employ it in the different departments of the fine arts, and to all who exercise it in the numerous fatiguing and diversified labours of the mechanic. An organ thus employed in such a variety of different offices, and executing each with promptness and precision, might naturally lead the unwary to imagine that it is composed of a great variety of subordinate organs, corresponding in number to the different duties which it has to perform. Such is the conclusion which one would draw in reasoning analogically from the works of art; but such a conclusion certainly would not follow in reasoning analogically from the works of nature; for although the hand be composed of many dissimilar parts, it is not constructed on the principles of a time-piece, whereof each index, as that for the hour, the minute, and the second, requires a distinct and appropriate apparatus. In the human hand all the parts are observed to combine in each operation; and it is certain that the varieties of its operations are not so much owing to the number of parts as to the varieties of their combinations; the combinations into which they enter being almost incalculable, while the parts themselves are comparatively few and easily counted. Taking the hand then as a specimen of the works of nature and of animal structure, and thence reasoning on the principles of analogy, with respect to the brain, ought we not to infer, that all the parts of which it is composed may also combine in a similar manner, and be concerned in every phenomenon which has been ascribed to it? This inference, it is true, is not, and cannot consistently be the inference of the phrenologists, who, upon the supposition that the brain is constructed as man would construct it, on the principles of art, imagine that each specific phenomenon or series of phenomena is the effect of a specific δυναμις, faculty, or *vita propria*[q]; and that each faculty or *vita propria* has a specific system of organs, by which it perceives, conceives, imagines, and remembers, in a manner peculiar to itself[r].

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[q] See above, p. 9.

[r] "The faculty of tune, for example, perceives, conceives, imagines, and remembers, melody alone; the faculty of caus-

If the metaphysicians have long been censured as too apt to substitute logical for physical distinctions, to personify what they call powers and faculties, to treat them in the abstract as separate agents, and only to view them as connected loosely, like a bunch of keys hung upon a ring, or like a number of engrafted branches of different species, deriving their nourishment from the same stock[s], the phrenologists seem inclined to carry this hypothesis still farther, and not only to increase the number of faculties, but the number of organs; for, exclusively of the organs of the five senses and other organs known to anatomists, they have either found or fancied they have found no fewer than thirty-three species of organs or systems of organs in the human brain; and each of these species in pairs: a pair for each species of propensity, a pair for each species of sentiment, a pair for each species of knowledge, and a pair for each species of reflection[t]. If you ask for any ocular demonstration respecting the existence of these organs, you are told they are in-

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ality, perceives, conceives, imagines, and remembers, ideas of necessary consequence and nothing else. One faculty, like one branch, comes to maturity sooner than another; one may be strong, and another weak, in the same or in different individuals; one may decay or become diseased, and the others remain vigorous; and all this in consequence of each faculty having a distinct and specific organ." *Illustrations of Phrenology*, by Sir George Mackenzie, Bart. p. 51. Edinb. 1820, 8vo.

[s] See above, p. 307.

[t] If there be any organs in the brain which are peculiar to one of its hemispheres, or any under the mesial plane which are not divisible into similar halves, where and what are they?

dicated by thirty-three modifications that have been observed in the form of the skull, and these occasioned by thirty-three modifications in the form of the brain; yet, on opening the skull, and examining the brain towards the surface where these organs are said to be situated, it seems to require no small share of creative fancy to see any thing more than a number of almost similar convolutions, all composed of cineritious and medullary substance, very nearly in the same proportions, and all exhibiting as little difference in their form and structure as the convolutions of the intestine; nay all, when unfolded, according to Spurzheim, in cases of *hydrocephalus internus*, presenting but one uniform web of cineritious and medullary matter. No phrenologist has ever yet observed the supposed lines of distinction between them; and no phrenologist, therefore, has ventured, in the course of his dissections, to divide a hemisphere of the brain accurately into any such number of well marked and specific organs. But, suppose it divided, and each organ or system of organs to be presented to another professed adept in the science, would he venture, were they presented promiscuously, to distinguish, merely by their form and structure, an organ of one propensity from another; an organ of propensity from an organ of sentiment, an organ of sentiment from an organ of knowledge, or an organ of knowledge from an organ of reflection? He would be a hardy phrenologist if he did, as these organs are not distinguishable by any characteristic appearances like the organs of sense.

On seeing an ear, an eye, a nostril, a hand, a tongue, no anatomist requires to be informed what these are, where they were situated, or how they were connected, to be able to say in what functions it had been employed: their marked peculiarities speak for themselves. No such differences appear among the organs assigned to the brain; and perhaps this circumstance may be adduced as one of the reasons why these organs have remained in concealment for so many ages; and yet this reason is scarcely admissible, considering especially, that these organs are never found at the base of the cranium, nor in any place where they cannot at all times be easily seen; nay, it appears that they so affect conspicuous situations, and so prone are they to obtrude themselves on the notice of the senses, that there is not any visible part on the crown of the head, on the frontal bone, on the occiput or the temples, where, according to phrenologists, they do not exhibit, even through the hardest and the thickest skulls, undeniable proofs of their actual presence. Is it then in order to be always within the sphere of physiognomic and phrenological investigation, that they equally avoid the central parts of the cerebral substance? But, if always thus confined to the surface and to the convolutions, for the sake of being seen, what becomes of the *corpus callosum*, the *septum lucidum*, the *fornix*, the *infundibulum*, the *two commissures*, the *corpora striata*, the *corpora quadrigemina*, the *pineal gland*, the *cornua ammonis*, and the *four ventricles*? Are these to be excluded from the number of organs, and not to be permitted to have any influence on the propensities, on the sentiments, the species of knowledge, or the species of reflection? Are they to be viewed merely as a part of the common stock on which the specific organs are engrafted, and through which they are connected? Another question also occurs, how does it happen that these organs seem to be destitute of muscular action? One should imagine that those faculties of which they are the residence would, beside deliberative organs, require corresponding executive organs, to bring their intentions, their resolutions, or their suggestions, when it is requisite, into visible operation. But where, it may be asked, are these corsesponding executive organs? To this question no answer has been given; and should it be said that the muscles of the face, of the head, neck, trunk, and extremities, may, by varying their infinite number of powers and of combinations, be sufficient for all executive purposes, will not such an answer lead to the conjecture that a small number of parts in the brain may, by similar combinations, suffice for all the species of propensities, the species of sentiments, and the several faculties of knowledge and reflection? That state certainly is not much to be envied, where there are more to advise than to listen, and more to command than are willing to obey. In all well regulated fleets, armies, and governments, the deliberative bodies are always few compared with the executive; and this seems agreeable to the order of nature, for it has long been a general observation, and undisputed among physiologists, that nature is always sparing in causes, though abundant in effects, while art, on the contrary, is abundant in causes, but scanty in effects. And hence the poet:

> "In human works, tho' labour'd on with pain,
> A thousand movements scarce one purpose gain;
> In God's, one single can its end produce;
> Yet serves to second too some other use[a]."

The phrenologists, therefore, in forming their system, seem to have forsaken nature entirely, and to have taken their model from art, and from art too in its most rude and incipient stages; for the more that any art is improved, the more are its general principles simplified, and thus, by approaching nearer to nature, the more is it productive of effects.

To the observations made by phrenologists on the forms of the head, as indicative of the several powers and capacities of the animating principle, if made with sufficient caution and accuracy, and if the relations which they wish to demonstrate can be fairly established upon the broad principles of induction, there can be no rational objection. Their supposed organs rest upon a quite different foundation: not being demonstrable in form or in structure, they must ever remain the mere offspring of a hypothesis; and of a hypothesis that may be disproved by what is termed a *reductio ad absurdum*.

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[a] Pope's Essay on Man, epist. i. v. 53.

Personally acquainted with Dr. Spurzheim, Sir G. Mackenzie, and Mr. Combe, aware of their candour, their liberal sentiments, and of their openness to freedom of discussion, I feel conscious that they will not be offended at these remarks made upon their system, but will readily acquiesce in them where they are just; where they are otherwise, will be able to refute them, or be able to show that I have misapprehended their meaning. Although I think that in many instances their premises are far from supporting their conclusions, and that the latter too frequently rest on the former, like a pyramid on its apex, or a broad superstructure upon a narrow and tottering basis; yet, to their writings I acknowledge myself to be much indebted for several new and important views which they have suggested, and therefore will never subscribe to the sarcasm, that what is true in their doctrines is not new, and that what is new in them is not true. Though evidently inclined to favour physiognomy, yet they seldom fail to caution their readers against its extravagancies; a warning, I suppose, which they have found to be highly requisite[x]: but although, like physiognomists, they be apt to ascribe more influence to the organs than is strictly warrantable, in many cases imagining them to command where they only obey, they never once question the existence of an internal animating principle, nor, like Cabanis, endeavour to maintain that whatever is moral and intellectual in man is merely the consequence of organic structure. Cabanis therefore can derive no support to his hypothesis from their observations; nay, so involved is that hypothesis in inconsistencies and contradictions, that he himself, after sincerely wishing it were true, after eulogizing those who have adopted it, and after additional arguments of his own to make himself believe it, has, nevertheless, his doubts and hesitations with respect to the solidity of the foundation upon which it rests. Reflecting on what may possibly be the cause of organization, he acknowledges, although with seeming reluctance, that he "cannot help thinking there must be a principle or vivifying faculty which nature has either implanted in the germs, or has diffused through the seminal fluids. It is there," he observes, "operations take place, the most astonishing of any which the universe has ever presented to the study of man; operations attended with circumstances so extremely delicate and complicated, and so deeply enveloped in mystery, that man has hitherto been able to discover only their more obvious phenomena. Yet we know," he says, "that in many plants, and in the greatest number of animals, the matter of their primary rudiments, or their primary rudiments themselves, when in every respect completely formed, exist separately from the cause which is necessary to give them life, that is to say, from *the prolific matter* which contains within it their vivifying principle. This last matter, by uniting itself with the preceding, forms with it a combination of a certain duration determined by circumstances. In the vegetable, it attaches itself to organs which are little known, but which afterwards certainly constitute a part of the bark: in the animal, it identifies itself with the nervous system, and thence extends its influence over the whole bodily frame, as long as the combination continues, or as long as nothing impedes the action of the vital organs[1].”

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[x] "It cannot be too often impressed on the student of phrenology, that it is *impossible* to know, by external signs alone, the character of any *individual.* We can only ascertain what dispositions he possesses most strongly."

"In short, let no one be in haste to become a physiognomist, lest he should betray ignorance, and injure the system of the truth of which he is satisfied." *Illustrations of Phrenology,* p. 25, 27.

From this language, obscure and vague as it certainly is, we may nevertheless perceive that Cabanis, in attempting to account for organization, is compelled to have recourse to a certain new species of matter which he calls the prolific, totally distinct from the matter composing the visible structure; a species of matter containing a vivifying faculty, and whose operations, in conjunction with that faculty, cannot be explained on any physical principles that are known. In making this reluctant confession, however, as he seems to be conscious that he will appear to most of his readers to be relinquishing his favourite hypothesis, to vindicate himself against the charge of any inconsistency, what does he do? why, with as unblushing an assurance as when he imputes opinions to Locke which Locke never held, and language to Hippocrates which Hippocrates never used; he endeavours to show that the vivifying principle, the existence of which he so reluctantly acknowledges, may possibly have no existence at all; and that, therefore, the expressions which he employs in making the acknowledgment, are in his opinion so general and vague as not to be susceptible of any definite interpretation. "I know but too well," he observes, "that the words *principle* and *faculty* have no precise meaning. Besides, I intend nothing more by them than a certain condition, without which, the phenomena peculiar to different species of organized bodies could not exist. Above all, I am far from being willing to infer positively, from these phenomena, the existence of a particular being, fulfilling the functions of *a principle*, and communicating to bodies the properties from which their functions result. The language of the metaphysical sciences would require an almost total reformation; but we are not yet sufficiently acquainted with their general system to attempt that reformation with success. Let us at least endeavour to admit as sparingly, and as seldom as possible, any mutual interchange of terms between the language of these sciences, and the language of physics[z]."

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[1] “ Quelque idée qu'on adopte sur la nature de la cause qui détermine l'organisation des végétaux et des animaux, ou sur les conditions nécessaires à leur production et à leur développement, *on ne peut s'empêcher d'admettre un principe, ou une faculté vivifiante, que la nature fixe dans les germes, ou répand dans les liqueurs séminales.* Comme c'est ici l'opération la plus étonnante de toutes celles qu'offre l'étude de l'univers, les circonstances en sont extrêmement délicates et compliquées : elles restent couvertes d'un voile mystérieux ; et l'on n'a pu jusqu'à présent, en saisir que les apparences les plus grossières. Mais nous savons que dans beaucoup de plantes, et dans la plupart des animaux, la matière de leurs premiers rudimens, ou leurs premiers rudimens eux-mêmes, déjà tout formés, existent à part de la cause qui doit leur donner la vie, c'est-à-dire, de la matière prolifique qui en contient le principe. Cette dernière matière, en s'unissant à la précédente,,forme avec elle une combinaison d'une durée quelconque, déterminée par les circonstances elles-mêmes. Dans le végétal, elle s'attache à des organes peu connus, mais qui font certainement ensuite partie de l'écorce : dans l'animal, elle s'identifie au système nerveux ; et de-là, elle exerce son influence sur tout le corps, pendant le temps que dure la combinaison, ou que rien n'empêche l'action des organes vitaux.” P. 245.

Such are the feeble and fruitless endeavours of this writer to extricate himself from the dilemma to which his hypothesis has ultimately reduced him; and were he not seemingly as insensible to shame as indifferent to the truth and accuracy of his statements, we might look upon him, in his aukward attempts to preserve this slight appearance of consistency, rather as an object of pity than of any thing else. And yet, such is the man whom a number of those who have adopted similar sentiments consider as one of the ornaments of their sect, and to whose authority they bow with as servile and abject a submission as the ancients did to the tales of their augurs or the dictates of their oracles. An English writer, who has taken from him a motto for his title page, and who, in support of the hypothesis, that all the phenomena of organization as well as the other phenomena of life may be explained upon physical principles, has, in addition to what he denominates the active powers of matter, such as the chemical, mechanical, and vital, also introduced a creature of his own, which he terms *living function ;* a thing which performs a great variety of important offices in every living system, but of whose origin he professes himself to be utterly ignorant. "The origin," he says, "of living function is enveloped in inextricable mystery. The existence of organized matter depending upon function, and function reciprocally requiring organized arrangements, they exhibit a circle unmarked by commencement or termination [a]."

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[z] "*Principe* et *faculté* sont des mots dont le sens n'a rien de précis; je le sais trop bien. Au reste, je n'entends par-là, que la condition sans laquelle les phénomènes propres aux différens corps organisés, ne sauroient avoir lieu. Je suis sur-tout bien loin de vouloir conclure affirmativement de ces phénomènes, l'existence d'un être particulier, remplissant les fonctions de *principe* et communiquant aux corps les propriétés dont leurs fonctions résultent. La langue des sciences métaphysiques auroit besoin d'être refaite presque en entier: mais nous n'avons pas encore assez éclairci leur système général, pour tenter avec succès cette réforme. Tâchons du moins de nous payer mutuellement de mots, le moins et le plus rarement possible." P. 245.

To those who are acquainted with the manner of the ancients in explaining the revolution of events by eternity and the circle, or to those who are acquainted with the writings of Buffon, Cuvier, Cabanis, Robinet, Maupertuis, and other hylozoists, this writer will present nothing that is new respecting life and organization : he indeed exhibits a peculiar vanity in calling his work "Sketches of the Philosophy of Life." Sketches they may be of his own opinions, of the course of studies by which he has acquired them, and of the language in which he has been accustomed to announce them; but, deplorable would be the state of philosophy, were they sketches of any thing that, in the estimation of rational thinkers, was ever entitled to the name of philosophy. From the language of his title page, he seems to have derived his ideas of philosophy entirely from the vulgar, who generally imagine that whatever savours of heresy or scepticism, as it cannot be religion, must therefore be philosophy[h]; and hence it is that with the vulgar thousands of pretenders pass for philosophers, who have never suggested a single idea that has been of use in art or in science, in morals, religion, or even in the innocent amusements of life.

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[a] Sketches of the Philosophy of Life, by Sir T. C. Morgan, M. D. p. 35. London, 1818, 8vo.

SECTION XIX.

OPINIONS OF CHAPTAL AND OF DR. THOMSON WITH RESPECT TO THE SHARE WHICH CHEMICAL AFFINITIES HAVE IN THE ORGANIZATION OF ANIMALS.

In what way materialists have learned that all unknown causes are certain occult qualities of matter, or certain unknown chemical affinities, has never been explained. To talk of things as totally unknown, and yet to pretend to know the particular genus or species to which they belong, is so glaring an absurdity, that it is singular how the materialists, notwithstanding the confusion of their ideas, have never perceived it. The vague notions which they entertain of the several processes of organization, as being solely the natural effects of chemical affinities, are seemingly strong presumptive proofs that they are little acquainted with either; and that their supposed organizations and chemical affinities have no existence but in their own fond imaginations. Not pretending myself to be accurately acquainted with all the real effects of chemical affinities, I subjoin the sentiments of two chemists who have been acknowledged throughout all Europe, by those who are most capable of judging, to be eminently conversant in whatever relates to their own science, and whose opinions should therefore outweigh the opinions of thousands of arrogant pretenders, who talk not only of unknown affinities, but of unknown affinities that are totally incompatible with those which are known.

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[h] "Hereof is risen this proverbe among the common people, that the greatest philosophers are wonte to be the greatest heretikes." Henrie Cornelius Agrippa, *of the Vanitie and Uncertaintie of Artes and Sciences*, Englished by la San. Gent. c. 53. Lond. 1575, 4to.

"The mineral bodies upon which we have hitherto treated," says Chaptal, "possess no life or vital principle, properly speaking; neither do they exhibit any phenomena dependent upon internal organization. The crystallization affected by substances of this kingdom appears to be exceedingly different from the organization of living beings. It produces no advantage to the individual; and at most serves only to prove the great harmony of nature, which marks its several productions with constant and invariable forms. But the organization of vegetable and animal beings disposes those bodies in such a manner as is respectively the most proper to accomplish the two final purposes of nature; namely, the subsistence and reproduction of the individual[e]."

"The imperfect success of chemistry in that branch of the science which has the study of man for its object, arises from the very nature of the subject itself. Some chemists, by considering the human body as a lifeless and passive substance, have supposed the humours to undergo the same changes as they would have been subject to out of the body; others, from a very superficial knowledge of the constitution of these humours, have pretended to explain all the phenomena of the animal economy. All have mistaken or overlooked that *principle of life* which incessantly acts upon the solids and fluids; modifies, without ceasing, the impression of external objects; impedes the degenerations which depend on the constitution itself; and presents to us phenomena which chemistry never could have known or predicted by attending to the invariable laws observed in inanimate bodies.

"None of the bodies of the mineral kingdom is governed by an internal force. They are all subjected to the direct action of foreign substances, without any modification from any vital principle; and the air, water, and fire, produce in them effects which are necessary, constant, and subject to calculation: whence it happens that we are able to determine, modify, and vary the action of these various agents at pleasure. It is not the same with living bodies: they are all indeed subject to the influence of external bodies; but the effect of these is modified by the reaction of the vital principle, and is varied according to the disposition of that principle. The chemist cannot therefore determine these effects *a priori*, and in a general way. He must search for his results rather in the living body itself than in the operations of his laboratory; and can have no assistance from his analysis but in ascertaining the nature of their component parts. But their action, effects, or transpositions, can only be known by a serious study of the functions of the living body. Chemistry can perform every thing in the mineral kingdom, because every thing depends on the laws of the affinities. But, in the kingdoms of organized beings, this science is subordinate to the laws of the economy of living bodies; and its results can only be affirmed to be true, when they are confirmed by observation.

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[e] Chaptal's Elements of Chemistry, translated from the French, vol. iii. p. 1. 3d edit. Lond. 1800, 3 vols. 8vo.

"The more the functions of the individual are independent of organization, the less is the empire of chemistry over them, because the effects are modified in a thousand ways; and it is this which renders the application of chemical principles to the phenomena of the human body so very difficult: for the organization is not only very complicated, but the effects are continually varied by the powerful influence of the mind[d]."

"WHAT is the power," says Dr. Thomson, "which prevents the gastric juice from acting on the stomach during life? Certainly neither a chemical nor mechanical agent, for these agents must still retain the same power after death. We must, then, of necessity conclude, that there exists in the animal an agent very different from chemical and mechanical powers, since it controls these powers according to its pleasure. These powers, therefore, in the living body, are merely the servants of this superior agent, which directs them so as to accomplish always one particular end. This agent seems to regulate the chemical powers, chiefly by bringing only certain substances together which are to be decomposed, and by keeping at a distance those substances which would interfere with, or diminish, or spoil the product, or injure the organ; and we see that this separation is always attended to even when the substances are apparently mixed together: for the very same products are not obtained, which would be obtained by mixing the same substances together out of the body, that are produced by mixing them in the body; consequently all the substances are not left at full liberty to obey the laws of their mutual affinities. The superior agent, however, is not able to exercise an unlimited authority over the chemical powers; sometimes they are too strong for it: some substances, accordingly, as madder, make their way into the system; while others, as arsenic, decompose and destroy the organs of the body themselves.

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[d] Ibid. p. 280.

" But it is not in digestion alone that this superior agent makes the most wonderful display of its power; it is in the last part of assimilation that our admiration is most powerfully excited. How comes it that the precise substances wanted are always carried to every organ of the body? How comes it that fibrin is always regularly deposited in the muscles, and phosphate of lime in the bones? And, what is still more unaccountable, how comes it that prodigious quantities of some one particular substance are formed and carried to a particular place, in order to supply new wants which did not before exist? A bone, for example, becomes diseased and unfit for the use of the animal; a new bone therefore is formed in its place, and the old one is carried off by the absorbents. In order to form this new bone, large quantities of phosphate of lime are deposited in a place where the same quantity was not before necessary. Now, who informs this agent that an unusual quantity of phosphate of lime is necessary, and that it must be carried to that particular place? Or, granting, as is most probable, that the phosphate of lime of the old bone is partly employed for this purpose, who taught this agent that the old bone must be carried off, new-modelled, and deposited and assimilated anew? The same wonders take place during the healing of every wound, and the renewing of every diseased part.

"But neither in this case is the power of this agent over the chemical agents which are employed absolute. We may prevent a fractured bone from healing, by giving the patient large quantities of acids. And unless the materials for new-wanted substances be supplied by the food, they cannot in many cases be formed at all. Thus the canary bird cannot complete her eggs unless she be furnished with lime.

"As this agent which characterises living bodies does not appear to act according to the principles of chemistry, any inquiry into its nature would be foreign to the subject of this work. Physiologists have given it the name of the *living* or *animal* principle; and to them I beg leave to refer the reader[e]."

"No sooner is the animal dead, than the chemical and mechanical agents, which were formerly servants, usurp the supreme power, and soon decompose and destroy that very body which had been in a great measure reared by their means[f]."

SECTION XX.

OPINIONS OF DES CARTES.

It is known and acknowledged that many arrangements of plants and animals which are adopted by naturalists are artificial; temporary arrangements being found not only convenient, but necessary to facilitate the discovery of natural arrangements. Of the natural arrangements which have been discovered, there is no order, genus, or species, that has been found to relinquish, by a total metamorphosis, its own peculiar and distinctive characters, and to assume those of another. All these characters, by the will of heaven, seem permanently fixed, and every species of animating principle to be strictly limited to definite species of organized structures. Entertaining these sentiments, many of the ancients who held the doctrine of the metempsychosis believed that the soul, on leaving its body, could only migrate into another of the same species[g]; while others, by giving a much greater latitude to their fancy, imagined that the soul might migrate into any body indifferently, that the soul of man might animate a brute, and return again to animate a man. It was particularly this last idea of the metempsychosis that roused the indignation of Christians, who held it impious in the extreme to suppose that man, the image of God, could be transformed into that of a brute, or a brute into the image of God. St. Chrysostom therefore scruples not to maintain that it was the devil who invented this doctrine; and that he has always insidiously laboured to propagate and support it by means of philosophers[h].

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[e] Thomson's System of Chemistry, vol. iv. p. 642. 5th edit. Lond. 1817, 4 vols. 8vo.

[f] Ibid. p. 645.

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[g] See above, p. 7.

[h] " Ut atheismum funditus dirueret [Cartesius], profligare voluit teterrimam illam opinionem, quæ incorpoream atque incor-

Among these philosophers Florentius Schuyl enumerates Zoroaster, Pythagoras, Anaxagoras, Plato, Pliny, Plutarch, Porphyry, and Lipsius, remarking there were likewise innumerable others of the same description, and that Aristotle himself cannot with justice be entirely exculpated. This learned translator of Des Cartes *de l'Homme*, is therefore of opinion, that that philosopher has performed an essential service to religion, by attempting to prove, or rather by proving, as he has imagined, that the lower animals are mere machines, and that all phenomena, which have hitherto been ascribed to what physiologists denominate sensitive and vegetative life, are purely the effects of mechanical

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ruptibilem mentem, cujus ratione homo speciali prærogativa dicitur imago Dei, nimia brutorum affinitate profanando, hominem in bruta, brutaque in homines, nefanda quadam metamorphosi et metempsychosi commutare satagit. Quam vanitatem, ut inventum quoddam diaboli, merito detestatur B. Chrysostomus Homil. 4. in acta, exclamans, per philosophos hoc semper egisse diabolum, ut ostenderet, nostrum genus nihil a brutis differre. Et sane quam plurimos non infimæ notæ philosophos ejus fuisse sententiæ, notius est, quam ut probari debeat. Id certe docuerunt Zoroaster, Pythagoras, Anaxagoras, Plato, Plinius, Plutarchus, Porphyrius, Lipsius, aliique pene innumeri. Nec magno intervallo ab hoc errore distare videtur, quod Aristoteles ait haud procul ab initio libri viii. Histor. Animal., nimirum, se propemodum statuere, animam humanam, ætate puerili, nihil ab anima brutorum differre: quam et prudentiæ et disciplinæ capacem ait lib. i. Metaph. cap. 1. quamvis alibi distinctione, quam paulo post rejicimus, facultatis æstimativæ a cogitativa sive ratione, belluarum animas ab humanis sejungere nitatur." Florentii Schuyl Præfatio in Cartesium *de Homine*.

structure: a structure supposed by Des Cartes and his translator to circulate blood, to respire, to digest, to hear, to see, to taste, to touch, to smell, to hunger, to thirst, to eat, to drink, to sleep, to awake, to quarrel, to fight, and to kill one another, actuated entirely by no other causes than such as produce the motions of a watch, of an artificial fountain, of a mill or any of the like pieces of machinery[1].

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[1] "Corpus autem statuam duntaxat machinamve quandam terrestrem esse suppono, quam Deus destinata opera nostro corpori persimilem format; adeo ut non colore modo, atque figura, quibus membra nostra extrinsecus exornantur, sit conspicua; sed etiam interioribus illis partibus, quibus edat, bibat atque respiret, abunde sit instructa; omnesque illas nostras actiones imitetur, quæ fingi possunt a materia promanare, atque a sola organorum dispositione dependere. Certe quia horologia, fontes arte facti, molæ, aliæque similes machinæ, solius humanæ industriæ opera, vi quadam sese velut sua sponte movendi sunt prædita, indubium est, me tantam motuum varietatem imaginari non posse, quibus illa machina, quam a Deo factam suppono, agitetur: nec illam tam affabre factam concipere, quin longe perfectiora illi inesse suspicari liceat.

"Postremo velim consideres omnes functiones, quas huic machinæ adscripsi; cibi videlicet concoctionem, cordis arteriarumque pulsum, membrorum nutritionem, augmentationemque, respirationem, vigiliam et somnum, luminis receptionem, sonorum, odorum, saporum, caloris, aliarumque similium qualitatum in organis externorum sensuum: sed et impressionem idearum, ab ipsis efformatarum in organo sensus communis: tum conservationem illarum idearum in memoria: internos præterea motus appetituum atque passionum: denique motus externos membrorum omnium, qui tanta harmonia sequuntur, tam objecta sese sensibus offerentia, quam passiones et impressiones in memoria occurrentes, quas tam accurate, quam fieri potest, imitantur. Ut hæ, inquam, functiones in machina nostra naturaliter exerceantur ex sola organorum ejus dispositione. Omnino quemadmodum motus horologii aliusve istiusmodi automatis

They indeed admit that machines of these wonderful properties cannot be constructed but by the deity, though from a regard to their own hypothesis, and the fancied dignity of their rational souls, they rather seem to question whether even the deity can extend the powers of mechanism farther. Thus, after accomplishing all that is required by their hypothesis, they with very little appearance of ceremony, and much less of modesty, would prescribe limits to his power and intelligence; and doubt whether he, who can so easily construct machines, capable of exhibiting not only the ordinary phenomena of instinct, but the cunning of the fox, and the sagacity of the dog and the elephant, can, after all, construct a machine capable of exhibiting the phenomena of reason. Chiefly devoted to the contemplation of their own superiority, and ignorant of, or undervaluing the inferior part of the animal creation, they fondly imagine that their rational soul is beyond the reach of even divine mechanism itself, and that being independent, as they suppose, at least, independent as to its existence, of visible structure, it must therefore be immortal. Now,

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per dispositionem appensorum ponderum et rotularum. *Ut propter illos videlicet motus necesse non sit concipere aliam quandam animam, sive vegetativam sive sensitivam, aliudve motus, vitæque principium, quam sanguinem illius, et spiritus agitatos: nimirum calore ignis, qui in corde illius jugiter ardescit. Cui sane igni alia non est natura, quam cæteris omnibus, qui corporibus inanimatis inesse deprehenduntur.*" Renatus des Cartes *de Homine*, Latinitate donatus a Florentio Schuyl, p. 1, 120. Lugd. Bat. 1664, 4to.

granting that it is, on what ground does Schuyl conclude that a principle thus not necessarily connected with the human structure, may not occasionally take up its residence in other similar pieces of mechanism? Anatomists remark the striking resemblance between the brains of various quadrupeds and the brain of man; and not only a resemblance between their brains and his, but between the several organs and functions in them and in him. What rational motive can then be assigned for any to suppose, that among so many similar machines, the human machine of all others should alone be tenanted or occupied by a soul? If evil spirits can enter into swine, why may not also a rational soul, with sensual propensities, be inclined to occupy a similar abode, and there feel itself more comfortably lodged, than in a machine where it might daily have cause to apprehend the infliction of punishment for every act of brutish indulgence? I am not an advocate for either of the two doctrines of metempsychosis, as I know not one authenticated fact nor a shadow of analogy by which they are supported. But, be that as it may, they certainly are not directly opposed, nor are they even indirectly confuted by any arguments advanced by Des Cartes. In his work *de Homine*, so far at least as I have observed, there is not even a single allusion either to metempsychosis or metamorphosis. In composing that work, Des Cartes might probably have had a different object in view; namely, to gratify himself and some other persons who, like him, might have felt highly indignant at the idea that the animating principles of the lower animals should survive their bodies, and be received along with them into a future state. As the Sadducees, however, a sect of the Jews, could not discover in the pentateuch or prophets any clear revelation of the soul's immortality, of a future state, or of the existence of angels or spirits, Des Cartes and his followers can scarcely appeal to the Old Testament for any clear evidence of the distinction between what is to be the ultimate fate of man and of beast; and though a presentiment of immortality be deeply interwoven in the human constitution, and most clearly revealed in the New Testament, yet this testament affords not a hint that the animating principles of plants and animals are to be dissolved along with their bodies. As to animals particularly, several visions of St. John in the apocalypse would imply the contrary[k]. But, if reserved for a future state, and destined, like man, in a new heaven or a new earth to animate new bodies, and of different materials, who will presume to say to the Omniscient and the Almighty, that after fulfilling his purposes here, they can answer no other purpose hereafter? If reserved, however, we can readily suppose that they are not reserved to receive either rewards for virtues or punishments for crimes, as not being conscious of moral distinctions. Yet, who can with any confidence assert that they may not be reserved for another purpose? May they not be reserved as forming many of the customary links in the chain of being, and, by preserving the chain entire, contribute there, as they do here, to the general beauty and variety of the universe? Besides, as the deity hath created them all for his own pleasure, and not for ours[l]; though some individuals of the human species, in that blessed state, may no longer feel any interest in them; yet to others of more contemplative minds, may they not be a source not only of sublime, but of perpetual delight? In them may they not again behold many of the objects which had been once familiar and dear? objects peculiarly fitted to awaken the most agreeable of all recollections: those objects which first induced them to study and to admire the wondrous works of divine power, wisdom, and goodness; those objects which again may be seen uniting with the hosts of heaven and the stars of light, in proclaiming the praises of the most high[m]; those objects, in short, which, with many additional motives of gratitude, may again become a powerful incitement to exclaim in raptures, with Moses and the Lamb, Great and marvellous are thy works, Lord God Almighty.

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[k] Rev. iv 6, 7, 8, 9. v. 11. xix. 14.

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[l] Rev. iv. 11.

[m] See Psalm 148.

SECTION XXI.

THE PRIDE OF MAN TOO MUCH FLATTERED—CRUELTY TO ANIMALS TOO MUCH ENCOURAGED—AND SEVERAL FEELINGS OF OUR NATURE INSULTED BY DES CARTES'S HYPOTHESIS.

Racine the younger, in two poetical epistles to the duchess of N****, believes, that in defending the opinions of Des Cartes, he is justifying the ways of God to man [n], by supposing that divine benevolence and mercy would never have subjected the lower animals to such apparent hardships and cruelties, were they any thing more than insensible automatons [o]. From such a hypothesis, it should necessarily follow, that no treatment whatever of animals can be considered as allied to cruelty, and that, contrary to the judgment of Solomon, a righteous man only betrays his ignorance and folly, when he regardeth the life of his beast [p]. According to Racine, we may therefore not only torture animals, but dissect them alive, without any stain upon our honour, and without any stings of remorse [q]. Besides, there are other obvious advantages, which, in his opinion, result from this hypothesis. It furnishes us with arguments to defend our rights; to plead more successfully the cause of man, and to show more clearly that his nature is different, and his rank superior to that of brutes; "for who," asks this rigid Cartesian, "who is the man that, considering the high destinies of his nature, would ever consent to adopt the opinion, that contemptible brutes, fated to grovel for ever on the earth, should partake with him in that divine light which reminds him of his illustrious origin? Consult reason," says he, "its eternal oracle will tell you, as it has told me, that our immortal being, the soul, that ray of the deity, his vivifying breath,

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[n] "C'est la cause du ciel que je plaide aujourd'hui."
Oeuvres de M. L. Racine, tom. iv. p. 56. edit. Amst. 1750, 6 tom. 12mo.

[o] "Lorsque des préjugés brisant la longue chaîne
Ma raison libre enfin, me parle en souveraine,
Ce chien qui suit mes pas (duchesse, plaignez-moi:
Je le répete encore à regret, je le croi)
Ce chien ne m'offre plus qu'une trompeuse image
De la fidélité qui paroît son partage.
Insensible automate, il me suit sans me voir :
Il fait mes volontés sans jamais les sçavoir.
Sans colere il s'irrite, il gémit sans se plaindre;
Sans m'aimer il me flatte, et me fuit sans me craindre.
Le sang fait tout en lui, seul maître de son corps,
Sans qu'une âme préside au jeu de ses ressorts.
Si dans quelques momens, touché de ses caresses,
D'un cœur prêt à l'aimer j'écoute les foiblesses ;
Si dans les châtimens qu'il me paroît souffrir,
Par ses cris douloureux je me laisse attendrir,

Descartes, ou plutôt la Raison me rappelle,
Et dictant contre lui sa sentence cruelle,
Le déclare *machine*." P. 43.

[p] Prov. xii. 10.

[q] "Ah! réparons du moins notre gloire offensée,
Et loin des animaux écartons la pensée.
Pour calmer nos remords, et sauver notre honneur,
Croyons que nos sujets ignorent leur malheur." P. 63.

his own image, is a gift which he has resolved to bestow only on the fairest of his works[1].”

To suppose that brute animals are sentient, that they are alive to pleasure and to pain, and know what actions are deserving of reward and deserving of punishment, and yet to suppose, at the same time, that their existence is limited to this earth and a few years, without any chance of being prolonged, even by metempsychosis, would be, thinks Racine, to accuse heaven itself of injustice. On these suppositions, “how unjust,” he exclaims, in addressing the duchess, “how very unjust would be its decrees with regard to the watch-dog, that useful slave, that trusty guardian, so faithful to his master, and so terrible to thieves, who groans in his prison, loaden with chains, and is grudgingly fed upon black bread and bran! How very unjust, must you allow, would be its decrees with respect to him, were you to suppose him a sentient being; and more especially while another individual of the same species, and much less deserving, is made the object of your fond caresses, is sumptuously fed, and permitted, when drowsy, to sleep upon your knee; and, in short, I may say, to participate in your love[s]?"

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[1] “Oui, c'est de l'homme ici que je plaide la cause,
Et pour lui-même enfin, contre lui je m'oppose.
Pouvez-vous consentir qu'à nos fers destinés,
D'indignes animaux à la terre bornés,
Partagent avec nous cette clarté divine
Qui nous rappelle à tous notre illustre origine?
Consultez la Raison: son oracle éternel
Vous dira comme à moi, que notre être immortel,
L'âme, rayon de Dieu, son souffle, son image,
Est un don qu'il n'a fait qu'à son plus bel ouvrage.” P. 45

Such are the reasonings of a virtuous, sincere, but fanciful poet, who displays little art in defending his hypothesis, and but very little skill in his attempts to convert a duchess, by trying to persuade her that her favourite lap-dog is a mere automaton, without a spark of gratitude for her kindness, and with nothing but a shadow of attachment to her person.

Cardinal Polignac, another poet, in attempting to support this notion of Des Cartes, that the lower animals are mere machines, founds one of his arguments upon the striking uniformity of their conduct; a uniformity which he thinks must be owing to the deity who directs their operations[t]: but, though this supposition may well account for their many proofs of apparent sagacity, yet, without allowing them some freedom of choice, how will it account for the numerous deceptions to which they are liable, and for those instances of stupidity and brutishness for which they are proverbial even in the scriptures; those writings which Des Cartes, Racine, and Polignac, acknowledge to contain the express sentiments of the deity himself?

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[s] "Ce dogue, utile esclave, et garde incorruptible,
Si fidelle à son maître, aux voleurs si terrible,
D'une chaîne accablé gémit dans sa prison:
On lui plaint un pain noir, paîtri d'orge et de son:
Qu'un astre différent éclaira la naissance
De ce chien, tendre objet de votre complaisance!
Rassasié, content, il dort sur vos genoux;
Et pour tout dire enfin, il est aimé de vous.
Le ciel auroit il pu, juste dans sa vengeance,
Entre des criminels mettre tant de distance?" P. 58.

[t] "Automaton parvo suspensum momine, parvo
Impulsum, motus quos credis sponte coortos,
Affectusque omnes animi intus agentis, et iras
Atque odia, invidiam et vivos simulabit amores:
Dummodo mentem aliam fatearis, nempe supremam,
Quæ præsit. Quod quis si forte retorqueat in nos,
Ne dicatur homo propria quoque mente care.

Those who seem to wish that the existence of the lower animals should begin and terminate with their visible structure, are generally more successful in believing than in demonstrating the truth of their hypothesis. They invariably talk of the wonderful wonders performed by automatons and chemical affinities; then triumphantly ask, what greater wonders might we not expect from automatons constructed by the hands of the deity, or

Non solum ex dictis, verum hoc convincitur ipso,
Quod sibi quisque hominum sit conscius et sibi testis
Ipse suæ mentis: de se nemo ambiget unquam.
  Certe, si brutis animantibus inter agendum
Consilii et propriæ vis conscia mentis adesset,
Atque affulgerent certi vestigia quædam
Delectus, ratio non his rata semper agendi
Una foret; varii vario sed tempore motus
Exorti, solitam seriem immutare laborum,
Nativosque adeo possent infringere mores.
Nam non omnis homo parili se tegmine vestit;
Nec similem carpit victum, similemque loquelam
Ore refert; nec totum uno fera bella per orbem
More gerit, conditve domos, aut navigat æquor,
Aut terram exercet; leges nec servat easdem."
POLIGNAC, *Anti-Lucretius*, lib. vi. v. 816.

See above, p. 281.

from chemical affinities directed by his skill? We should certainly reply, much greater wonders: but, are any animals formed like automatons? or are any of their spontaneous or voluntary motions found to proceed from any of the known principles of mechanics? or have chemical affinities ever been observed to produce any thing like the organism either of a plant or an animal? Automatons indeed may be made to resemble the form of an animal, and likewise to imitate a few of its motions, while accidental though remote resemblances of at least the forms of some parts of a plant or an animal may occasionally be found in the mineral kingdom: but, upon comparing their internal structure, is there a shadow of resemblance to be found between the most artfully constructed automaton and the lowest link that belongs to the chain of animated being? A transformation of the one into the other would be as miraculous as any of the metamorphoses in Ovid: the difference between them is so very wide, that one might suppose no imagination could possibly confound them, unless when reason and reflection were asleep, absent, or under the influence of a spell induced by the witchery of some hypothesis. It is singular that those who, on comparing a senseless automaton with a sentient animal that lives, grows, and propagates its kind, can observe so striking an analogy between them, as to arrange them in the same class; and more singular still that those, who in one case cannot perceive so obvious a difference, should in another perceive the minutest shades of distinction, and discover that an infinite number of links in the chain of being is found to be wanting between the genus of man and the ape; two genera which appear very closely to resemble one another, not only in external form and structure, but in many of their instincts, appetites, and passions. It is here the Cartesians begin to overlook and to disregard all analogies in form and in structure, and to talk only of the wide differences that may subsist between the causes that move such similar structures and forms. But, admitting with them what seems to be true, that in many instances the differences of character, arising from disposition and action, depend not so much upon the differences of form and structure, as upon the varieties or specific differences of the principles which move and direct the organisms; of what service can such a concession be to their hypothesis? It seems calculated rather to undermine than to support it; for if the difference between the characters of a man and an ape is chiefly to be traced to the causes which move and regulate their organisms, how is it possible, on this hypothesis, to class automatons with plants or animals? We know the causes of motion in automatons; we see how they operate; but we cannot see, and never can demonstrate in theory or in practice how such causes can make an automaton to live, to grow, and to propagate its kind. In short, the forms and motions of automatons which induce the interested and cunning to pretend, and the ignorant to believe, that there is an analogy between them and animals, are merely the consequences of the juggler's art or of optical deception. With certainly much more apparent reason may materialists presume to arrange man with the lower animals, than these Cartesians to arrange either an animal or a plant with their automatons; presuming with most unaccountable arrogance, that the ways of God must always be as their ways, and that he can only construct animals upon the principles by which they construct pieces of machinery. Were they only anxious to prove that the soul of man is immortal, and not from vanity, arrogance, or contempt, to deny to the animating principles of brutes a share in that distinction, they would have better served their hypothesis by allowing the chain of being to continue without interruption from the meanest animal or the meanest plant upwards to man; and, knowing that man is acknowledged by all to be the highest link belonging to the visible part of the chain, would have dwelt particularly upon those peculiarities of his nature, which indicate a connexion between him and the lowest link belonging to the part of the chain which is invisible; nay, would have supposed, from general analogy, that the invisible portion of the chain is in like manner continued upwards, without interruption, until it reaches the creator of all, to whom there is nothing that bears a resemblance, and therefore nothing that can be compared with him.

As an evidence that man is the link intermediate between the two portions of the chain, they might mention his almost irresistible tendency to dream and to think of invisible beings more powerful, active, and intelligent than himself; might mention that general, if not indeed universal impression, that death is not to terminate his existence; his strong propensity at all times to pry into futurity, to consult physiognomists, astrologers, gypsies, beasts, birds, and even the dead, about what is to happen; that general, if not universal feeling, that he is to be accountable in another world for the thoughts and actions of his present life; that want of success in all attempts which have hitherto been made to eradicate these notions from his thoughts; and, above all, the reluctant concessions of atheists themselves, who, denying the existence of an invisible, yet all-seeing God, are under the necessity of having recourse to other invisible agents in his stead, as nature, fate, occult qualities, and a great variety of singular and unknown chemical affinities, which they are obliged to endow with a certain number of his attributes, to enable them to act, like him, upon plans, and with a semblance of intelligence and foresight.

The atheist, as well as others, we perceive, is compelled to believe in the existence of invisible agents; to admit that these have been operating from eternity; that they are the sources of all the order and beauty of the universe; that they are the causes of life and of death; and that by them he lives, moves, and continues to have being. He differs from others only with respect to some of the attributes of invisible agents; as he dreads a future state and a future judgment, he dislikes the idea of any powerful invisible agent that has the least spark of intelligence, of moral principle, or the least notion of distributive justice[u]. He is therefore particularly enraged against priests who inculcate such doctrines[x]; thinks every species of religion, superstition, and every reverie of his own, philosophy; boldly asserts that all the properties of matter are inherent; that Newton's disciples deserve not an answer, who suppose that attraction may be dependent on the will of the deity[y]; hopes that the belief in a deity is not universal; thinks that this belief must have arisen from some mistaken notions of matter conceived by fools, and encouraged by knaves[z]; pretends that, whatever Newton may have thought, the Caffres, the Hottentots, and the savages of Brazil, have never yet adopted his creed[a]. He assigns no cause for this difference of opinion; but if Newton was led to believe in a God from his being ignorant of the properties of matter, the inference from the hypothesis must be, that the Caffres, the Hottentots, and savages of Brazil, from being much better informed, have escaped the error into which Newton fell. In Peyrard's opinion, to suppose a deity who feels, who thinks, and who governs the world by his power and intelligence, would be to suppose that he must have organs, or to suppose, what he conceives to be an absurdity, that the deity can, like nature and fate, occult qualities and chemical affinities, operate without them[b]; a privilege which the atheist never allows to be exercised by any invisible agents but his own, and by no species of intelligent beings. Upon his hypothesis, all thoughts must proceed from sensation, sensation from organism, and organism from the properties of matter[c]: besides, all the regular movements observable in the universe must be the consequence of the laws of matter, which, acting from necessity, cannot act otherwise than it does[d]. How culpable then, and how detestable in his eyes, must be the conduct of tyrants and of priests, who, upon the supposition that his divinities Nature and Fate are the mere creatures of his own imagination, or, granting they are beings, as he represents them, yet dare to treat them as if they were asleep or in a state of dotage! Nay, hold the whole of his creed in contempt, disregard what he calls the laws of necessity, and, in opposition to what he supposes to be the eternal, inherent, the unalterable and irresistible properties of matter, presume, in defiance of such a number of his supposed omnipotent powers, to declare to mankind that there is a God, a being of a much superior nature; that invisible tyrant, as Peyrard terms him, who watches over the conduct of men, who will punish their delinquencies in a future state, and of whom, even the very idea, in his opinion, is sufficient to carry desolation, and madness, and utter consternation, into the souls of terrified mortals[e].

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[u] "Au reste, si la formation des animaux, leur façon d'agir, étoient une preuve qu'ils sont des effets d'une cause intelligente; leur destruction, leur dissolution, devroient prouver de même que ces êtres sont des effets d'une cause privée d'intelligence et de vues constantes.

"Je demande à ceux qui pensent que Dieu nous dédommagera dans une autre vie des maux que nous souffrons dans celle-ci, sur quoi ils fondent leurs espérances. Si la sagesse, la bonté de leur Dieu se dément si souvent dans ce monde, qui pourra les assurer que sa conduite cessera un jour d'être la même à l'égard des hommes, qui éprouvent sur la terre tantôt ses bienfaits, tantôt ses disgraces? Si Dieu n'a pas voulu rendre ses créatures completement heureuses dans ce monde, quelle raison ont-ils de croire qu'il le voudra dans un autre?" Peyrard, *De la Nature et de ses Lois*, p. 17, 20. edit. Paris, an. 2. de la République, 12mo.

[x] "Les persécutions, les violences sans nombre exercées au nom de Dieu, l'abrutissement et l'esclavage dans lesquels les prêtres plongent par-tout les nations, sont les motifs qui m'ont déterminé à composer cet ouvrage." P. 1.

[y] "Les disciples de Newton nous disent que la vertu attractive est une vertu inhérente aux corps par la seule volonté de Dieu; cela ne mérite aucune réponse." P. 75.

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[z] "Je réponds que le consentement universel des hommes sur un objet qu'aucun d'entre eux n'a jamais pu connoître, ne prouve nullement son existence: le consentement des hommes à reconnoître un Dieu ne prouve rien, sinon qu'ils se sont formé des idées fausses de la matière, et que des fripons ont su tirer parti de leur crédulité." P. 21.

[a] "Mais en second lieu, il est faux que tous les peuples de la terre reconnoissent un Dieu; les Hottentots, les Caffres, les Brasiliens, n'ont aucune espèce de religion." P. 22.

[b] "Je réponds d'abord, qu'un être intelligent est un être qui pense, qui veut, qui agit pour parvenir à une fin; ou, pour penser, pour vouloir, pour agir, il faut avoir des organes; ainsi, dire que l'univers est gouverné par un être intelligent, c'est dire que l'univers est gouverné par un être pourvu d'organes, attendu que sans organes, il ne peut y avoir ni sensation, ni volonté, ni action." P. 13.

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[c] "J'ai démontré que la faculté de penser se réduit à la faculté de sentir, et que la faculté de sentir est une suite de l'organisation des animaux; d'où je conclus que la faculté de penser est une suite de l'organisation des animaux." P. 61.

[d] "De ces différentes combinaisons, il résulte des tous physiques, des corps dont les propriétés, les façons d'agir sont des suites nécessaires des matières ou des élémens qui sont entrés dans leur composition, et des arrangemens divers de ces mêmes matières.

"Les molécules de la matière, après avoir, par des combinaisons particulières constitué des êtres divers, se séparent, et en se combinant ensuite d'une nouvelle manière, elles forment des êtres nouveaux.

"Je réponds en second lieu, que les mouvemens réglés que nous voyons dans l'univers, sont des suites des lois de la matière qui ne peut agir autrement qu'elle n'agit; que l'ordre de l'univers est la disposition de ses parties rigoureusement nécessaire." P. 2, 3, 14.

Such are the sentiments, and such the language of a French philosopher in the second year of the French republic[f]. With as little scruple as the author of the *Systéme de là Nature*, he presents atheism without a veil to the eyes of his countrymen, who he knew had previously been so far prepossessed in its favour, by the masqued writings of the Marquis D'Argens, Buffon, Maupertuis, Helvetius, and others. To the questions which are so puzzling to an atheist, whether did an egg produce the first bird, or did a bird produce the first egg? whether did nature form the first parent of every species a male or a female? or how, under the laws of necessity impelling her to act always in the same uniform manner, came she to form two parents at once of different sexes, and then to alter her original plan, by producing all the rest of the species by a new process—that of generation? To these questions he only returns the evasive answers that have been repeatedly hackneyed by atheists for thousands of years[g]. Such questions, he says,

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[e] "Après avoir démontré, de la manière la plus claire et la plus solide, que tous les effets que l'univers nous présente, sont des résultats nécessaires des diverses combinaisons de la matière; après avoir renversé de son trône ce tyran invisible dont l'idée fantastique portoit la désolation et le délire dans l'ame des mortels consternés; après avoir établi les principes de la morale sur les rapports éternels qui subsistent entre les hommes, l'auteur du Systême fait ainsi parler la nature: 'Reviens, enfant transfuge, reviens à la nature; elle te consolera, elle chassera de ton cœur ces craintes qui t'accablent, ces inquiétudes qui te déchirent, ces transports qui t'agitent, ces haines qui te séparent de l'homme que tu dois aimer." Préf. p. xxxiii.

[f] And such also the language and doctrines of another French work, entitled, *Le Vrai Sens du Systême de la Nature,* which, as well as the work called *Systême de la Nature,* an anonymous London editor, probably from a wish to procure them celebrity,

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and to recommend them to the respect and attention of Englishmen, has ascribed to Helvetius, and caused them to be published along with the acknowledged works of that writer. See *Œuvres Complettes de M. Helvetius.* Lond. 1777, 4 tom. 8vo.

In a Paris edition of the works of Helvetius, in 5 vols. 8vo. printed for Briand, in the second year of the Republic, these anonymous works are not to be found. So much for the ardent atheistical zeal of this London editor, to enlighten Britain by his liberal views of religion and politics.

[g] "Mais, me demandera-t-on encore, y a-t-il eu un premier homme dont les autres soient descendus? Y a-t-il eu de tout temps des mâles et des femelles? L'œuf est-il antérieur à la poule ou la poule à l'œuf? Il n'est pas donné à l'homme de répondre à ces différentes questions; l'expérience et le raisonnement ne nous apprennent rien sur l'origine primitive de l'homme." P. 11.

fall not within the province of philosophers; their object, he says, is to speak of things only as they are, and to rest their conclusions upon their experience. If any other answer should be demanded, he can only say, what has been said by those of his sect a thousand times over, that matter and motion, with all their real and all their imputed properties, are eternal; that these have been operating from all eternity, without intermission; that all events have, from eternity, been revolving in a circle; that if what are called causes produce effects, effects in their turn produce causes similar to the causes which produced them[h]. Such is another specimen of the language of those who pretend to reason only from their experience; and yet one should imagine that, if they have not been existing from eternity, and observing all the various revolutions which have taken place through eternity till now, they ought to talk with a little more caution, and to think a little more, before they assert from their own experience, that the world has never had a beginning nor will ever have an end.

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[h] "Tel est le cercle éternel que tous les êtres sont forcés de décrire; c'est ainsi que le mouvement fait naître, conserve quelque temps et détruit successivement toutes les parties de l'univers, tandis que la somme de l'existence reste toujours la même." P. 5.

CHAP. IV.

OPINIONS OF THOSE WHO SUPPOSE A LIVING INTERNAL PRINCIPLE DISTINCT FROM THE BODY, AND LIKEWISE THE CAUSE OF ITS ORGANIZATION.

SECTION I.

OPINIONS OF ARISTOTLE.

HOWEVER inadequate art may be to imitate the various processes in nature, and particularly the vital, conceited men of narrow comprehensions will always be disposed to judge of the Deity's ways by their own, and to see his wisdom only in proportion as he acts agreeably to their preconceived theories and opinions. Nor is this folly peculiar to the weak and the inconsiderate; it has its foundation in the human constitution: for there has not been a time, nor is it likely that there will be a time, when, what Bacon calls the *idola tribus*, the *idola specus*, the *idola fori*, and *idola theatri*, will cease to have their influence, more or less upon all men. From his account, it is almost incredible what a number of idols have crept into philosophy, by the reduction of natural operations to a correspondence with human actions; in other words, to a correspondence with those ideas which have their origin in the imperfect state of the senses, and in the misconceptions of the understanding; in the peculiarities of mind, body, education, and custom; in the undefined language of intercourse; in the tenets of philosophers, and in their perverted modes of demonstration[a].

Aristotle, whose talents and acquirements would have eminently distinguished him in any age, has, in his work concerning the soul or vital principle[b], furnished us with numerous and striking instances of the various effects of these idols on the notions and reasonings of his predecessors who had treated of life and organization. Thus he informs us that Aristoxenus and some others, from perceiving that the tones naturally expressive of the different passions may partly be imitated by musical instruments, was led to imagine that the soul might have somewhat of a similar origin, might be the effect of organic structure, and nothing more than a species of harmony; while others, again, more particularly conversant in the science of numbers, supposed it a number moving itself; an idea, certainly, in the literal sense, not very comprehensible, though Aristotle be at pains to confute it[e]. In the same way, by bringing down the processes of nature to the common level of human capacity, Hipparchus and his followers, from observing that the solids of animals and plants are formed out of fluids, concluded that the soul and every thing else originated in water. Heraclitus and his followers, on the other hand, from observing that animals cannot live without breathing, and that breath is a vapour, supposed that the soul was an exhalation from the surface of the body. A fourth set observing, with Critias, that animals die when deprived of their blood, or when their blood ceases to flow, conceived that the blood was either the life, the cause of life, or the vehicle of life. A fifth set, from attending chiefly to the temperature of animals, ascribed life to the element of fire, which, by its influence in the season of spring, awakens the torpid energies of nature, like plants and animals feeds upon other bodies around it, and increases not only in bulk but in strength, by a process which they thought somewhat analogous to growth and assimilation. A sixth set, from observing that fire cannot be supported without air, which is so pleasing and refreshing to animals, and so very necessary to their existence, imagined that the phenomena of life belonged more properly to that element than to the element of fire, which in many cases is so very destructive to animated beings. Among all their speculations, none of them, says Aristotle, ever ascribed any share of the vital phenomena to the element earth, unless when combined with some of the rest, or when supposed a compound of the whole, or the origin of the whole[d]. A seventh set, not observing sensation to be a property of any of the elements, imagined that the soul might be an emanation, or some portion of that power which moves and actuates the universe at large. An eighth set, from never observing the phenomena of life unaccompanied with motion, imagined that the soul might be the consequence of some particular species of motion; while a ninth set, from observing that animals can begin and suspend their motions at pleasure, concluded that the soul was rather a cause than a consequence of motion.

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[a] Bacon, Novum Organum, lib. i. § 41. *et seqq.* necnon De Augmentis Scientiarum, lib. v. cap. 4.

[b] Aristotelis Opera, vol. i. p. 616.

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[e] Pythagoras and those who chose to denominate elements units, a mode of expression countenanced by Timæus, Plato, and Zenocrates, in order to preserve a consistency of language, viewed the combinations of the elements as numbers; and as the elements are often in motion without any apparent cause, they assumed that the numbers which represented them were also moveable, and could move themselves. In the same way, when they chose to represent any of their elements symbolically by a mathematical point, they also assumed that the point could move itself and describe a line; that the line, when it moved in a lateral direction, would describe a surface; and that surfaces, when united at curves or at angles, would describe a solid; and that the solid, according to the surfaces which circumscribed it, might be a cube, a prism, a cone, or a solid of any figure whatever. Thus they, as well as Aristoxenus, distorted nature and her operations, to suit their own capricious fancies.

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[d] Παντα γαρ τα στοιχεια κριτην ειληφε, πλην της γης· ταυτην δ᾽ ουδεις αποπεφανται, πλην ει τις αυτην ειρηκεν εκ παντων ειναι των στοιχειων, η παντα. (P. 621.) Those of the ancients who imagined that the soul was a substance, imagined at the same time that it was a substance of a very subtile nature. It was thus that Diogenes thought it was air, as air, in his opinion, was the most subtile of all bodies; αερα, τουτον οιηθεις παντων λεπτομερεστατον ειναι; and on that account not only very susceptible of motion, as a τι κινουμενον, but, as Thales imagined, a source of motion, as a τι κινητικον. And such also was one of the reasons why Heraclitus thought that it might be a vapour, which, in his language, is very incorporeal, ασωματωτατον; always in motion, flowing like a stream, ρεον αει. P. 620.

In making his remarks upon these hypotheses, Aristotle observes, that there is not any of the three elements, or, including the earth, any of the four, nor all the four taken together, and combined with motion, that can account for the organization, not to say of an animal, but even of a plant. He infers, therefore, that there must be a something either within, or at least connected with every living body, different from the elements; and which, not being motion, but a cause of motion, though not a cause moving itself, which, he thinks, is absurd, can by its powers render the elements subservient to its purposes, counteract, modify, and direct their tendencies, compel them to enter into new combinations, and, by acting upon a definite plan, force them to construct regular systems, which, by their natural and inherent properties, when not restrained by superior influence, they would tend to destroy but never to preserve. What else, he asks, can it possibly be that in living bodies prevents for a time the fire and the earth from being carried in opposite directions, the fire upwards and the earth downwards? They would undoubtedly separate and be dispersed, if there were not something present to restrain them; and if there be any thing that does, it must be the soul or principle of life, the cause at the same time of growth and nutrition, as nothing is nourished that partakes not of life[e]: and if the phenomena of life be various, it most assuredly cannot be the body that holds them together; for the soul, on the contrary, seems rather to hold the body together, and, therefore, as soon as the soul departs, the body degenerates into corruption, and is afterwards gradually dispersed into air[f].

In these observations Aristotle certainly differs very widely from Leucippus, Democritus, Epicurus, and Lucretius, who, although they might have had his opportunities, his ardour, and his patience in investigation, possessed not his mind; that mind so eminently distinguished from ordinary minds by the vigour of its intellect, its powers of comprehension, its quickness of perception, and acuteness of discernment: and yet the man possessed of that mind was not always proof against the influence of those idols which originated in the tenets of his time, and in those perverted modes of demonstration by which logical entities were but too frequently confounded with physical. Thus, from his partiality to dialectics, while taking a general view of the subject previously to his entering on minute detail, he suggests, among others, several queries which certainly would not readily occur to a modern physiologist. Thus, he asks, Under which of the categories does the vital principle fall to be arranged? Whether or not is it a substance, a quality, or a quantity[g]? Whether or not is it something in capacity or an actuality[h]? Whether or not is it separable into parts, or is it without parts[i]? Whether or not are all souls of the same species, or if there be different species of souls, whether or not are there different genera? Whether or not, as the term, in Greek, signifying to live, implies heat, are we to suppose all souls of a hot nature; or as the word corresponding to soul, in the same language, implies cold, are we to suppose them of a cold nature? Men, he observes, when they happen to speak of the soul in general, mean the human soul; but whether or not will the same description apply to every soul? As the term animal includes a variety of genera and species, can we reasonably describe any one species merely by the properties which are common to them all? or would not rather every species require a separate and specific definition, as, the soul of the horse, the dog, and the man[k], the soul of a plant or of a wild beast[l]? As every soul is characterized by one or more of the following faculties, the nutritive, sensitive, cogitative, and motive, whether or not, when two or more are found in conjunction, ought we to view them as so many souls, or only as so many parts of a soul? They readily admit of a separation in a logical sense, that is to say, of separate definitions; but whether or not will they also admit of a separation in a physical sense, that is to say, can one of them be actually detached from the rest? can one, for instance, be restricted to the brain, another to the thorax, and a third to the cavity of the abdomen[m]?

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[e] Τι το συνεχον εις τἀναντια φερομενα, το πυρ και την γην· διασπασθησεται γαρ, ει μη τι εσται το κωλυσον· ει εστι, τουτ' εστιν ἡ ψυχη, και το αιτιον του αυξανεσθαι, και τρεφεσθαι. - - - Τρεφεται δ' ουδεν ὁ μη κοινωνει ζωης. P. 635.

[f] Λεγουσι δε τινες μεριστην αυτην [ψυχην] ειναι, και αλλω [μοριω] μεν νοειν, αλλω δε επιθυμειν. Τι ουν δηποτε συνεχει την ψυχην, ει μεριστη πεφυκεν; ου γαρ δη γε το σωμα· δοκει γαρ τοὐναντιον μαλλον ἡ ψυχη το σωμα συνεχειν· εξελθουσης ουν διαπνειται και σηπεται. P. 629.

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[g] Αναγκαιον διελειν, εν τινι των γενων, και τι εστι· λεγω δε ποτερον τοδε τι, και ουσια, η ποιον, η ποσον, η και τις αλλη των διαιρεθεισων κατηγοριων. P. 617.

[h] Ετι δε ποτερον των εν δυναμει οντων, η μαλλον εντελεχεια τις. Ibid. In translating the words δυναμις and εντελεχεια, I have followed the learned Mr. Harris. See Philosophical Arrangements: Harris's Works, vol. ii. p. 84, 223. edit. Lond. 1801, 2 vols. 4to.

[i] Σκεπτεον δε, και ει μεριστη, η αμερης. P. 617.

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[k] Και ποτερον ὁμοιοειδης ἁπασα ἡ ψυχη, η ου· ει δε μη ὁμοιοειδης, ποτερον ειδει διαφερουσιν, η γενει· νυν μεν γαρ οἱ λεγοντες και ζητουντες περι ψυχης, περι της ανθρωπινης μονης εοικασιν επισκοπειν. Ευλαϐητεον δε, ὁπως μη λανθανη, ποτερον εἱς ὁ λογος αυτης εστι, καθαπερ ζωου, η καθ' ἑκαστον ἑτερος, οἱον ἱππου, κυνος, ανθρωπου, θεου. P. 617.

[l] Ὡστε καθ' ἑκαστον ζητητεον, τις ἑκαστου ψυχη· οἱον τις φυτοῦ, και τις ανθρωπου, ἡ θηριου. P. 634.

[m] Ὁτι ἡ ψυχη τουτων εστιν αρχη των ειρημενων, και τουτοις ὡρισται, θρεπτικῳ, αισθητικῳ, διανοητικῳ, κινησει. Ποτερον δε τουτων ἑκαστον εστι ψυχη, η μοριον ψυχης; και ει μοριον, ποτερον οὑτως ὡστ' ειναι χωριστον λογῳ μονον, η και τοπῳ; P. 632.

When an insect or a plant is divided into parts, there follows, he observes, no separation of its faculties; for each part, while it continues to exhibit faculties, exhibits them in conjunction as in the entire insect or plant[n]. As for the intellective and contemplative faculty, it is not so obvious that it may not be separated from the rest; it appears to him to be of a different genus, and, therefore, susceptible of a separate residence and a separate existence; a thing which is eternal admitting necessarily of a separation from that which is corruptible. With regard however to all the other faculties, it is obvious, he thinks, that, if once conjoined, they are not separable from each other, as some have asserted[o]. Of plants, where the species of faculty is one, but the individuals of the species many, separated portions are observed to live and to propagate their kind, as not being parts or fractions of a whole, in a physical sense, but distinct individuals, destined by nature to be gregarious, or to live in groups; and therefore when detached, are separated only from the community of other individuals of the same species with which they had been formerly associated. In insects, on the contrary, where the three faculties, the nutritive, sensitive, and locomotive, are inseparably conjoined, the detached parts continue to exhibit the effects of life only for a time: and the reason which Aristotle assigns for the difference is, that they want organs to continue their existence[p]; an opinion certainly not very reconcileable with his general opinion, that the soul constructs organs for itself. If the three faculties in the separated portions be similar to the whole from which they were separated, as he has asserted, why may not they, as well as the whole from which they were separated, also construct either new organs or new parts of organs for themselves, and, like the whole, prolong their existence, and propagate their species? The truth seems to be, that Aristotle has here confounded the cause and the effect; the principle of life and that transient irritability which continues for a while[q] in a separated limb. But, surely the principle may communicate properties to the structure which it forms, without communicating any parts of itself; and thus we see that organized structures, even long after death, continue to retain several of their properties, some for a shorter, some for a longer period of time, and some even for a series of centuries.

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[n] Εν ἑκατερῳ των μοριων ἁπαντα ενυπαρχει τα μορια της ψυχης· και ὁμοειδη εισιν αλληλοις, και τῃ ὁλῃ. P. 629.

[o] Περι δε του νου και της θεωρητικης δυναμεως, ουδεπω φανερον, αλλ᾽ εοικε ψυχης γενος ἑτερον ειναι· και τουτο μονον ενδεχεται χωριζεσθαι, καθαπερ το αϊδιον του φθαρτου· τα δε λοιπα μορια της ψυχης, φανερον εκ τουτων, ὁτι ουκ εστι χωριστα, καθαπερ φασι τινες.

Των δε δυναμεων της ψυχης αἱ λεχθεισαι, τοις μεν ενυπαρχουσι πασαι, καθαπερ ειπομεν· τοις δε τινες αυτων, ενιοις δε μια μονη. P. 632, 633.

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[p] Των φυτων ενια διαιρουμενα φαινεται ζωντα, και χωριζομενα απ᾽ αλληλων, ὡς ουσης της εν αυτοις ψυχης, εντελεχειᾳ μεν μιας εν ἑκαστῳ φυτῳ, δυναμει δε πλειονων. (P. 362.) Και των ζωων ενια των εντομων ὡς την αυτην εχοντα ψυχην τῳ ειδει, ει και μη αριθμῳ· ἑκατερον γουν των μοριων αισθησιν εχει, και κινειται κατα τοπον επι τινα χρονον. Ει δε μη διατελουσιν, ουδεν ατοπον· οργανα γαρ ουκ εχουσιν ὡστε σωζειν την φυσιν· αλλ᾽ ουδεν ἡττον εν ἑκατερῳ των μοριων ἁπαντα ενυπαρχει τα μορια της ψυχης· και ὁμοειδη εισιν αλληλοις, και τῃ ὁλῃ. P. 629.

[q] Επι τινα χρονον.

After enumerating the several opinions entertained by others concerning the soul, Aristotle proceeds to favour us with his own; when, as usual, he mixes dialectics with physics, although fully aware of the distinction between these two branches of science, and although he well knew how differently the naturalist and the logician are accustomed to define the same phenomena[r]. In commencing his own account of the soul, he at once pronounces it to be a substance belonging to the order of real entities, and to consist of ‘Υλη and an Ειδος: the ‘Υλη, in his sense, being something common to all substances, but without a single quality of its own, excepting an indefinite power or capacity to receive any quality from an Ειδος[s]. The term Ειδος, though translated into Latin by the word *forma*, and into English by the word *form*, does not however, in the language of Aristotle, signify merely a form or a figure, but a cause of form; and therefore all the various qualities by which substances are known, or by which they are distinguished, are owing to an Ειδος. The soul, therefore, being that thing which characterizes an animated body, and which distinguishes it from that which is inanimate, is the Ειδος of such an animated body. And because the soul or principle of life has a greater influence in giving form and character to body than any thing else, Aristotle calls it Ειδος ειδων, the form of forms, as the hand, by way of eminence, is the organ of organs[t]. Besides, as the soul is the primary source of all the energies of a

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[r] Were a naturalist and logician, says Aristotle, to define anger, the former would refer it to the heart or the blood, the latter to some species of feeling. Διαφεροντως δ᾽ αν ὁρισαιτο ὁ φυσικος τε και διαλεκτικος. P. 618.

[s] Πειρωμενοι διορισαι τι εστι ψυχη, και τις αν ειη κοινοτατος λογος αυτης, λεγομεν δη ἑν τι γενος των οντων, την ουσιαν· ταυτης δε το μεν ὡς ὑλην, ὁ

καθ' αὐτο μεν οὐκ εστι τοδε τι· ἑτερον δε, μορφην και ειδος, καθ' ἡν ηδη λεγεται τοδε τι· και τριτον, το εκ τουτων· εστι δε ἡ μεν ὑλη, δυναμις· το δε ειδος, εντελεχεια. P. 630.

Λεγω δ' ὑλην ἡ καθ' αὐτην μητε τι, μητε ποσον, μητε αλλο μηδεν λεγεται οἱς ὡρισται το ον. (Metaphysic. lib. vii. cap. 3. Opera, vol. ii. p. 908.) See also above, p. 92.

[t] Ἡ ψυχη ὡσπερ ἡ χειρ εστι· και γαρ ἡ χειρ οργανον εστιν οργανων· και ὁ νους δε, ειδος ειδων. (Vol. i. p. 656.) Among the various species of forms acknowledged by the ancients, the numerous tribe of animating principles held the first rank; for "there is nothing," says the learned Harris, "which distinguishes so eminently as these; and 'tis on the power of distinction that we rest the very essence of *form*. - - - The animating form of a natural body is neither its organization, nor its figure, nor any of those inferior *forms* which make up the system of its visible qualities; but 'tis the power which, not being that organization, nor that figure, nor those qualities, is yet able to produce, to preserve, and to employ them. 'Tis therefore the power which first moves, and then con-

natural organized body, he also calls it the Εντελεχεια of such a body; a word which has been translated into Latin by the word *actus*, as if it were an act of the body: but Aristotle means by it not only an act, but a principle of action; for after asserting that the soul is a substance, he adds that this substance is an Εντελεχεια, and that it may be in two states which bear to one another the same relation as science to contemplation, or as sleep to watching; in other words, that it may be either in a state of rest or in a state of action, a language which is undoubtedly not applicable to a mere act. After such an explanation of the term Εντελεχεια, he might certainly, with much propriety, say that the soul is the first Εντελεχεια, or, in other words, the first or primary principle of action of a natural organized body susceptible of life[u]: and should it

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ducts that latent process, by which the acorn becomes an oak, the embryo becomes a man. 'Tis the power by which the aliment of plants and animals is digested, and by such digestion transformed into a part of themselves. 'Tis the power, as oft as the body is either mutilated or sick, that cooperates with the medicine in effecting the cure. 'Tis the power, which departing, the body ceases to live, and the members soon pass into putrefaction and decay." Philosophical Arrangements: Harris's Works, vol. ii. p. 56, 59.

[u] Αναγκαιον αρα την ψυχην ουσιαν ειναι, ὡς ειδος σωματος φυσικου δυναμει ζωην εχοντος. Ἡ δε ουσια εντελεχεια· τοιουτου αρα σωματος εντελεχεια. Αὑτη δε λεγεται διχως· ἡ μεν ὡς επιστημη, ἡ δε ὡς το θεωρειν· φανερον ουν ὁτι ὡς επιστημη· εν γαρ τῳ ὑπαρχειν την ψυχην, ὑπνος και εγρηγορσις εστιν· αναλαγον δ᾽ ἡ μεν εγρηγορσις τῳ θεωρειν· ὁ δ᾽ ὑπνος, τῳ εχειν

be asked what he means here by a natural organized body susceptible of life, or having life potentially, he informs us in almost the next sentence, that by such a body he means nothing more than a natural organized body; and that were he to define the nature of the soul in general terms, he would say more concisely, that it is the first or primary Εντελεχεια of a natural organized body[x]; evidently meaning an Εντελεχεια, or principle of action totally different from that which is known to move an automaton, or an artificial organized body which cannot be made susceptible of life. And although he cannot prove, and does not believe that any Εντελεχεια, or what is equivalent, any soul or principle of action in a natural body, which exhibits merely the phenomena of nutrition, or the phenomena of nutrition and sensation, can exist in a state separate from its body, yet he is doubtful whether it may not exist in its body as a pilot in a ship[y].

In giving these definitions of the soul, Aristotle certainly did not foresee that any of his readers were to look to them alone for a full development of his sentiments upon the subject; and more especially as he tells them plainly, to-

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και μη ενεργειν· προτερα δε τη γενεσει επι του αυτου, ή επιστημη· διο ψυχη εστιν εντελεχεια ή πρωτη σωματος φυσικου ζωην εχοντος δυναμει. P. 630.

[x] Ει δε τι κοινον επι πασης ψυχης δει λεγειν, ειη αν ή πρωτη εντελεχεια σωματος φυσικου οργανικου. Ibid.

[y] Ετι δε αδηλον, ει ούτως εντελεχεια τού σωματος ή ψυχη, ώσπερ πλωτηρ πλοιου. P. 631.

wards the conclusion of these speculations, that they are only the rude sketches or outlines of his meaning [z]. Throughout the remaining part of his treatise, he delivers his opinions in a language more familiar and intelligible: thus, in considering what holds the fabric of the universe together, and forms out of the discordant elements a harmonious whole, he infers from analogy that it must be something similar in kind to that which forms and holds together an organized body, namely, a principle of life; and that this principle, from the appearance of order and design displayed in the universe, must also have intelligence; that consequently a being of life and intelligence must necessarily have been the first that existed, it being absurd, in his opinion, to suppose that any thing inferior in power or in excellence should produce another of a different species, superior in power and in excellence to itself: and it being impossible that any species of inanimate substance can be superior in power or in excellence to a principle of life, and still more impossible that it can be superior in these respects to a principle of intelligence, he infers from what he is led to conceive the most cogent of reasons, that the elements are not, as some have maintained, the most ancient of beings [a].

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[z] Τυπῳ μεν ουν ταυτῃ διωρισθω και ὑπογεγραφθω περι ψυχης. P. 631.

[a] Απορησειε δ᾽ αν τις και τι ποτε εστι το ἑνοποιουν αυτα· ὑλῃ γαρ εοικε τα γε στοιχεια· κυριωτατον γαρ εκεινο το συνεχον ὁ, τι ποτε εστι· της δε

But, besides a supreme animating principle, which he occasionally denominates Θεος, or God, and whom he describes as living for ever, unequalled in power, in beauty, and in virtue; the first and the last, the greatest and the best, the author and preserver of all, whether in the air, on the earth, or in the waters; who is invisible to mortal eyes, and who can be known only from his works; who is not incorporated with any of the elements, but who resides apart and alone in the highest heavens, thence extending his influence to this earth, which, being the farthest removed from his presence, exhibits most weakness, disorder, and confusion; every thing in nature partaking more or less of his influence, in proportion to its nearer or its greater distance from that exalted situation in the heavens where he resides[b]: besides this supreme animating

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ψυχης ειναι τι κρειττον και αρχον αδυνατον· αδυνατώτερον δ' ετι, του νου· ευλογωτατον γαρ ειναι τουτον προσγενεστατον και κυριον κατα φυσιν· τα δε στοιχεια φασι πρωτα των οντων ειναι. P. 627.

[b] These sentiments are very clearly and fully expressed in the sixth and seventh chapters of the treatise Περι Κοσμου, (Aristotelis Opera, vol. i. p. 610,) where Aristotle, or the author, whoever he was, speaking of the cause which holds the system of the universe together, observes, that according to an ancient tradition, which has been transmitted to every tribe of the human race, all things have proceeded from God, and are every moment dependent upon him for their continuance and mode of existence; a tradition, he observes, which some have explained as implying, that every thing is full of the divinity, but which he thinks should not be interpreted as implying omnipresence, but only unlimited power and influence, which the Deity, as preserver and governor of all,

principle, the author and preserver of all, there are many others, according to Aristotle, of an inferior and subordinate nature, which, by delegated powers, organize the bodies of animals and plants, so that all organized bodies whatever are to be considered as constructed by, and constructed for their animating principles[c]; which, like the great animating principle, from being invisible to mortal eyes, indicate their existence, their energies, and their species, only through the medium of the structures which they form. Now, of these structures they are not only the efficient causes, but, in his opinion, the formal and the final; the causes of their motions, growth, and nutrition; the causes which give them a character and form; the causes on whose account they exist; and even the causes of their being afterwards liable to corruption, as nothing is corrupted but what has been nourished, and has some

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exercises without weariness or fatigue over the most distant parts of the universe; and as every part enjoys more or less of his influence, as it is nearer or farther from his presence, so the things in heaven are more perfect than the things upon earth, or, as Milton says, in reasoning from a somewhat different hypothesis,

> "Are more refin'd, more spiritous, and pure,
> As nearer to him plac'd, or nearer tending."

See above, p. 232.

[c] Παντα γαρ τα φυσικα σωματα της ψυχης οργανα, καθαπερ τα των ζωων, οὑτω και τα των φυτων, ὡς ἑνεκα της ψυχης οντα· διττως δε το οὑ ἑνεκα· το, τι οὑ, και το ᾡ. P. 635.

time or other partaken of life[d]. But, besides being causes of organized structures in these different senses, they are subordinate to a higher power, which prescribes their operations, not merely with a reference to their separate and individual plans, but with a reference at the same time to that general and comprehensive plan on which the universe itself is constructed. The power which prescribes is Φυσις, nature, or the great animating principle of the universe. It is under the influence of such a power that every particular species of soul regularly constructs a system of organs adapted to its functions, as nature has willed that organs should always be suited to the functions, but not that the functions should be altered or modified to suit the organs[e]. It is therefore absurd, he thinks, to suppose that, according to the whimsical notions of Pythagoras, any species of soul may animate any species of body; for it appears that every particular species of soul has a particular species of body; and that those who talk of any soul's entering any body, talk the same language as if they were to say that the carpenter's art may enter into and be exercised by the flute of the musician, a thing which cannot be; and therefore it follows, that as every art necessarily requires peculiar instruments suited to its purposes, so every soul as necessarily requires a body peculiarly adapted to its functions [f], for there seems not to be any species of soul that inhabits the body of another species, nor a species of body that indicates a soul differing in species from that with which it is usually connected. Every species of soul appears uniformly to have its own species of body; and conversely, every species of body to have its own species of soul [g].

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[d] Εστι δε ἡ ψυχη του ζωντος σωματος αιτια και αρχη· ταυτα δε πολλαχως λεγεται· ὁμως δ' ἡ ψυχη κατα τους διηρημενους τροπους τρεις, αιτια· και γαρ ὁθεν ἡ κινησις αυτη, και το οὑ ἑνεκα, και ὡς ἡ ουσια των εμψυχων σωματων, ἡ ψυχη αιτια. - - - - Εστι δε και αλλοιωσις και αυξησις κατα ψυχην· ἡ μεν γαρ αισθησις αλλοιωσις τις ειναι δοκει· αισθανεσθαι δ' ουδεν, ὁ μη ψυχην εχει. Ὁμοιως δε και περι αυξησεως και φθισεως εχει· ουδεν γαρ φθινει, ουδ' αυξανεται φυσικως μη τρεφομενον· τρεφεται δ' ουδεν ὁ μη κοινωνει ζωης. P. 634, 635.

[e] Τα γαρ οργανα προς το εργον ἡ φυσις ποιει, αλλ' ου το εργον προς τα οργανα. *De Partibus Animalium*: Opera, lib. iv. cap. xii. p. 1042.

It is singular that Aristotle, after thus admitting and endeavouring to prove that every soul organizes its body, and constructs for itself peculiar organs suited to its faculties, should, notwithstanding, be inclined to believe that the souls of all animals and plants, as well as the nutritive and sensitive faculties of the human soul, are entirely indebted for their existence to the bodies which they have formed, and must consequently perish along with them; as if it should follow that a cause must depend upon its effects for its very existence, and that as soon as it ceases to operate, or appears not to operate, it must cease to exist. This opinion will appear the more singular, when we find him maintaining that the soul is not affected by age; that the dimness of sight and the effects of ebriety and sickness are not the consequences of any change in the state of the faculties, but only of a change in the state of the organs; and that in cases where the intellective and contemplative faculties seem to be impaired, we are only to infer that some of the organs of the body are diseased, that the faculties themselves may be still entire, and must be entire, from their being impassive and participating more of the nature of the Deity than the other faculties[h]. His opinion, however, that the νους or the intellective and contemplative faculties are the only faculties belonging to the soul which are separable from the rest, separable from the body, and in conjunction capable of maintaining a separate existence, is, however strange, not peculiar to Aristotle: it is also the opinion of several logicians, moralists, and divines, who are anxious to exclude from a future state the various souls of animals and plants, and even every species of vital faculty which the human soul possesses in common with the souls of the lower animals. Yet, after this exclusion, after stripping the soul not only of its body, but of most of its faculties, they seldom agree about the remainder. According to Aristotle, nothing remains of what is enjoyed in common with the body, neither love nor hatred, the power of reasoning, nor the remembrance of any thing that is past, but merely those faculties which without any feeling or motion understand and contemplate: According to others, who find some difficulty in conceiving how the soul, in such a desolate and unbodied state, can have any enjoyment, it is to retain some of those faculties which it has in common with the souls of brutes; and they hope that at least it will love and remember, and recognize some of its relatives and former friends, while a third class, after depriving it of a certain number of its wonted faculties, are disposed to endow it with several new species, that it may enjoy new species of pleasures in which it never before participated.

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[f] Οἱ δε μονον επιχειρουσι λεγειν, ποιον τι ἡ ψυχη· περι δε του δεξομενου σωματος, ουθεν ετι προσδιοριζουσιν, ὡσπερ ενδεχομενον κατα τους Πυθαγορικους μυθους, την τυχουσαν ψυχην εις το τυχον ενδυεσθαι σωμα· δοκει γαρ ἑκαστον ιδιον εχειν ειδος και μορφην. Παραπλησιον δε λεγουσιν, ὡσπερ ει τις φαιη την τεκτονικην εις αυλους ενδυεσθαι· δει γαρ την μεν τεχνην χρησθαι τοις οργανοις, την δε ψυχην τω σωματι. P. 624.

[g] Εν τοις φυσει γινομενοις, μαλλον αν τις συνιδοι ὡς οὑτως εχει προς αλληλα σωμα τε και ψυχη συμφυη, ὡστε των πλειστων αλληλοις αιτια γινεσθαι παθηματων· ουδεν γαρ πωποτε ζωον γεγενηται τοιουτον, ὁ το μεν ειδος εσχεν ἑτερου ζωου, την δε διανοιαν αλλου· αλλ' αει του αυτου το, τε σωμα και την ψυχην. P. 1169.

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[h] Ει γαρ λαβοι ὁ πρεσβύτης ομμα τοιονδι, βλεποι αν, ὥσπερ και ὁ νεος· ὥστε το γηρας, ου τῳ την ψυχην πεπονθεναι τι, αλλ᾽ εν ᾧ καθαπερ εν μεθαις και νοσοις· και το νοειν δη και το θεωρειν μαραινεται, αλλου τινος εσω φθειρομενου· αυτο δε απαθες εστι· το δε διανοεισθαι, και φιλειν, η μισειν, ουκ εστιν εκεινου παθη, αλλα τουδι του εχοντος εκεινο, ᾗ εκεινο εχει· διο και τουτου φθειρομενου, ουτε μνημονευει ουτε φιλει· ου γαρ εκεινου ην, αλλα του κοινου, ὁ απολωλεν· ὁ δε νους ισως θειοτερον τι και απαθες εστιν. P. 625.

It is strange to observe how many so fondly cherish the fancy, that a soul such as ours may, in a future state, like the Deity, be able to operate and exercise its various faculties independently of any thing like corporeal organs. The sacred scriptures afford no encouragement to entertain any such hypothesis. They explicitly inform us, that the human soul, after its departure from the present body, shall inhabit another, which is to be immortal; a species of body which, for aught we know, may be as different from the present body, as is the loathsome and the crawling caterpillar from the winged, the active, and the splendid butterfly; two species of forms which, in the progress of expanding faculties, are constructed by the same animating principle. What the form and the structure of the new and immortal body are to be, we neither know nor have any means of knowing; but that the same animating principle may, in different circumstances, construct new bodies, and successively pass from one into another, is what we know from daily observation. Even Plato, amidst all his refinements and abstractions, never imagined that the soul could at any time be without a body, or something equivalent, which he called a vehicle. In his opinion, the soul, which continued perfect and pure in his imaginary state of pre-existence, was furnished with wings, roamed at large through the regions above, and had all the world under its inspection; but if it happened to lose its purity, its wings dropt off, and then it fell down, till it met with something solid and resisting, where it was compelled to fix its abode, and where, assuming an earthly body, it caused that earthly body to move, although that body, in judging by the eye, seemed to move of itself. Thus the two, when conjoined, were called an animal, and that animal, considered as a whole, was pronounced mortal[i]. Nor did it, on assuming the earthly body, therefore, lay aside its immediate vehicle, which, whether it was formed of æther, or of light, or of the essence of the stars, was, according to Proclus, physically indivisible, immaterial, and impassive[k],

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[i] Τελεα μεν ουν ουσα και επτερωμενη [Ἡ ψυχη] μετεωροπολει τε και ἁπαντα τον κοσμον διοικει· ἡ δε πτεροῤῥυησασα φερεται, ἑως αν στερεου τινος αντιλαβηται· οὐ κατοικισθεισα, σωμα γηϊνον λαβουσα, αυτο αὑτο δοκουν κινειν δια την εκεινης δυναμιν, ζωον το ξυμπαν εκληθη, ψυχη και σωμα παγεν· θνητον τ' εσχεν επωνυμιαν. Platonis Phædrus: Opera, vol. x. p. 320. edit. Biponti, 1787, 12 vol. 8vo.

[k] Πασης μεριχης ψυχης το οχημα αϋλον εστι, και αδιαιρετον κατ' ουσιαν, και απαθες. Procli Institutio Theologica, cap. 207: In Platonis Theologiam Libri Sex. Hamburgi, 1618, fol. See also above, p. 10.

As every magnitude, however extremely minute it may be, is logically or hypothetically divisible into halves, into hundreds, or into ten thousands of parts, when Proclus asserts that the οχημα, or vehicle of the soul, is αδιαιρετον κατ' ουσιαν, he means not to assert that it is without magnitude, or that it is not divisible hypothetically, but only that it is not physically or actually divisible. It is from understanding that things are often considered as divisible in these two senses, that Aristotle asks, whether or not are the faculties of the soul separable from the body, and from one another, in a logical sense only, or in a physical sense also? λογῳ μονον η και τοπῳ; (See above, note [m]. p. 422.)—Gassendi has very clearly demonstrated, that the atoms of Democritus, of Epicurus, and others, were never supposed to be without parts, without form, or without gravity. As *primordia rerum*, or first principles, they were indeed distinguished by such epithets, as *individua*, *indivisibilia*, *insectalia*, *insecabilia*, *impenetrabilia*, *insensibilia*, *invisibilia*, and *mente percepta corpuscula*; but indivisible, not on account of their minuteness, as the vulgar imagine, but on account of their indissoluble solidity, δια την αλυτον στεῤῥοτητα. See Gassendi Animadversiones, vol. i. p. 177.

The meaning of αϋλον, another epithet which is here be-while the νους itself, or the intellective principle

stowed upon the οχημα, or vehicle of the soul, could not have been expressed either by ασωματον or ασωματοτον, which, literally translated, would be incorporeal, and most incorporeal, epithets employed by the earlier Greeks, to denote thin and very thin attenuated bodies (see above, note [d], p. 418.) but seldom or never, so far as I know, to express the sense which has been annexed to the terms αὔλος and immaterial. The Romans certainly had no such word as *immaterialis*, and probably not till generally acquainted with the Greek philosophy, and the word ασωματος, any such word as *incorporeus* or *incorporalis*. As these words are not to be found in the poem of Lucretius, it appears not unlikely that it is in allusion to what he conceived an improper use of the word ασωματος, when used to express the sense of αὔλος, that he labours to prove how every thing in nature, be it ever so minute, attenuated or invisible, must be corporeal, as in his opinion things which belong not to the class of bodies, cannot possibly be supposed to act upon bodies, nor bodies upon them.

Tangere enim et tangi, nisi corpus, nulla potest res.
Lib. i. v. 305.

See also above, p. 65, 86. But, in this opinion the learned Gassendi differs very widely from his favourite authors Lucretius and Epicurus, repelling and refuting at considerable length the various arguments of those philosophers who question the existence of incorporeal beings. See Gassendi, vol. iii. p. 1264.

With respect to the Greeks, as Aristotle and others employed the term Ὑλη or matter, to signify the substratum, or the ὑποκειμενον, the thing on which qualities are superinduced, they considered Ὑλη, when taken by itself, as destitute of every species of quality, except the capacity of being the recipient of all qualities. (See above, p. 425.) The Greeks, therefore, who entertained this idea of Ὑλη, could not, consistently with their hypothesis, apply the term αὔλος, or immaterial, to any thing which they viewed as an ουσια, or substance; that is, to any thing possessed of qualities. It was, therefore, I imagine, in later times, when the atomical or corpuscular philosophers were supposed to ascribe rather too much to what they conceived to be the properties of the Ὑλη προσεχης, or secondary, gross, or corporeal matter, that the followers of Plato, like their within, was supposed to be an essence without magnitude[1].

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master, much devoted to abstract speculations, began to think of the term αϋλος, and thus to deprive even the Ὑλη πρωτη itself, not only of the privilege of being the ὑποκειμενον of qualities, but of its long acknowledged reputation as a thing eternal and self-existent. But, as these notions of the later Platonists are partly adopted, and fully explained by the excellent, very learned, and ingenious Cudworth, I refer the reader for further information respecting their tenets upon this subject, to the fifth chapter of his admirable work, the *Intellectual System*, p. 771; and shall only observe, that Henry More, an enthusiastic admirer of Plato, had conceived so strong a dislike to matter, that he hardly can mention it without designating it by abusive epithets. Thus, in alluding to the primary *Eidos*, which first conferred qualities on matter, he says,

> This is the ancient Eidos omniform,
> Fount of all beauty, root of flowring glee,
> Hyle old hag, foul, filthy and deform,
> Cannot come near.——
>
> *A Platonick Song of the Soul*:
> Philosoph. Poems, p. 3. Camb. 1647, 8vo.

But if he meant in these lines to express his contempt for matter in general, Plato could have informed him, that the Ὑλη πρωτη, a passive, harmless, indescribable thing, had no qualities, and so nothing to render it the subject either of praise or abuse.

[1] Πας νους αμεριστος εστιν ουσια· ει γαρ αμεγεθης και ασωματος - - - ὁπωσουν μεριστον, η κατα μεγεθος η κατα πληθος. (Procli Institutio Theologica, cap. 171.) If the atoms of Democritus, Epicurus, and others, were indivisible on account of their indissoluble solidity, the Νους, or the intellectual principle, according to Proclus, is indivisible from a different cause, as it has no magnitude nor parts. Ου καλως το λεγειν την ψυχην μεγεθος ειναι· την γαρ του παντος δηλον ὁτι τοιαυτην ειναι βουλεται [Τιμαιος], οἱον ποτ' εστιν ὁ καλουμενος νους· ου γαρ δη οἱον γε ἡ αισθητικη, ουδ' οἱον ἡ επιθυμητικη. Aristot. vol. i. p. 622.

SECTION II.

OPINIONS OF HARVEY.

HARVEY, after spending an active life in studying the changes which take place in the form and structure of animals, from their embryo state to that of maturity; after anxious inquiries and repeated dissections to ascertain the relations that subsist between structure and functions; after carefully observing the successive phenomena which occur in the egg during incubation; and after a patient and attentive perusal of the works of authors who had previously written upon these subjects, arrives uniformly, when he is not fascinated by the witchery of his two favourite subjects, the blood and its heat, at the same conclusion which Aristotle drew from his observations, namely, that all animals and plants owe their form, their structure, their growth, and their power of resisting putrefaction, to an animating principle, which exists and operates before any organ of the structure can be formed[m].

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[m] "Plurimum itaque mecum ipse reputavi, quî fieret, ut ova improlifica gallinæ supposita, ab eodem calore extraneo corrumpantur, putrescant, et fœtida evadant; ovis autem fœcundis

In forming its organs, he regularly found that the first materials, on which such a principle operates, are furnished by the parent; that the struc-

idem non contingat. Sed in his liquores ambo (licet fœtus una cum excrementi pauxillo adsit) sani, salubres, et immutati permaneant; adeo ut, si quis coctos eos in tenebris comedat, nequeat a requieto ovo similiter cocto distinguere." Harveii *De Generatione Animalium exercitatio* 22: Opera Omnia, Londini, 1766, 4to.

"Quæ de anima nuper diximus videntur clare evincere, ovum neque uteri opus esse, nec ab eodem gubernari: manifestum enim est, animam vegetativam ovo etiam subventaneo inesse; quoniam ejusmodi ovum nutriri, conservari, augeri et vegetari cernimus; quæ dictæ animæ certissima indicia sunt. A matre autem vel matrice ea proficisci nequeunt, cum qua ovum nullam cohærentiam sive unionem habet; sed liberum et sejunctum, tanquam filius emancipatus, in cavitate ejus volutatur et perficitur, ut plantarum semina in terræ gremio; ab interno nempe principio vegetante: quod nihil aliud esse potest quam anima vegetativa.

"Multó vero magis constabit, animam ei inesse; consideranti, quo pacto, quove motore, vitellus rotundus et amplus, a vitellarii racemo abruptus, per infundibulum (exiguum nempe tubulum tenuissima membrana contextum, nullisque fibris motoriis instructum) descendat, viamque sibi aperiendo, uterum per tantas angustias adeat; ibidemque sese nutriat, augeat, albumine cingat. Cum interea nullum organum motorium in vitellario reperiatur, quod expellat; aut in infundibulo, quod transmittat; aut in utero, quod attrahat: neque ovum utero per venas jungatur, ut in ovario; nec per umbilicum ab eo dependeat; ut Fabricius vere asseruit, et clare ad oculum liquet. Quid superest igitur tam ingentia opera cernentibus, nisi ut cum Poeta dicamus,

Spiritus intus alit, totamque infusa per artus
Mens agitat molem.

"Certe fieri non potest, ut anima quercus vivant animalia ture of the parent always undergoes some previous changes for that purpose; and that in every stage of the progress there is always present a certain definite

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quæ in gallis nascuntur, licet quercui affixa vivant, et ex illius succo sibi alimentum petant. Similiter credibile est ovorum primordia in vitellarii racemo propria anima vivere, non autem matris; licet huic per venas et arterias cohæreant, et subministrato ab eadem alimento nutriantur." *Exercit.* 27.

"Ex dictis autem paradoxa quædam expendenda veniunt. Cum enim in ovo macula prius dilatetur, colliquamentum concoquatur et præparetur, plurimaque alia (non sine providentia) ad pulli formationem et incrementum instituantur, antequam quidpiam pulli vel ipsa primogenita ejus particula appareat; quidni utique credamus calorem innatum animamque pulli vegetativam ante pullum ipsum exsistere? Quid enim aliud effectus atque operationes vitæ producat, quam illarum causa et principium efficiens; calor nempe et facultas animæ vegetativæ? Ideoque, non videtur anima esse actus corporis organici vitam habentis in potentia; talem enim actum formam pulli censemus. Cui autem alii, quam ipsi pullo, formam inesse putemus aut animam? nisi formas separatas esse dicamus, aut metempsychosin aliquam concedamus.

"Hoc autem manifestissime apparet, ubi idem animal successione formarum, ut ait Aristoteles, vivit; exempli gratia, eruca, chrysalis, papilio. Idem enim esse principium efficiens, nutriens, et conservans, in singulis his (licet sub diversis formis) necesse est; nisi aliam animam in puero, in adolescente aliam, aliamque in sene constituamus, aut eandem formam erucæ et necydali, ac papilionis et bombycis affirmemus. Qua de re Aristoteles accurate scripsit, et nos postea plenius dicemus.

"Videtur præterea paradoxon sanguinem fieri et moveri spirituque vitali imbui, antequam ulla organa sanguifica vel motiva exstiterint. Nec minus novum atque inauditum inesse sensum ac motum in fœtu, priusquam cerebrum exstructum fuerit; movetur enim fœtus, contrahit, et explicat sese, cum pro cerebro adhuc nihil conspicuum est præter aquam limpidam.

range of temperature suited to the processes to be employed, and to the species of system to be organized. As the plan, however, upon which it operates, and of which it appears to be totally unconscious, implies much power, intelligence, and foresight, Harvey ascribes it exclusively to him upon whom the system of the universe depends; to that omnipotent and eternal being who is the creator and preserver of all, and who, causing his subordinate and unconscious agents to construct organized systems of matter in various places at the same time, and yet with the utmost order and precision, would appear himself to be every where present as the superintendent and the director[n].

"Adhæc, corpus nutritur et augetur, antequam organa coctioni dicata (ventriculus nempe et viscera) formantur. Sanguificatio etiam (quæ secunda coctio appellatur) perficitur ante primam (in ventriculo), quæ chylificatio dicitur. Primæ et secundæ coctionis excrementa (nempe in intestinis, atque urinæ ac fellis vesicula) ipsis concoquentibus organis sunt coætanea. Denique, non modo in vegetativa animæ parte, sed et ante animam ipsam, inest mens, providentia, et intellectus; qui cuncta statim a prima origine ad pulli esse et bene esse disponunt, ordinant ac procurant, adque formam et similitudinem generantium arte effingunt." *Exercit.* 57.

[n] "Quapropter rem recte pieque, mea quidem sententia, reputaverit, qui rerum omnium generationes ab eodem illo æterno atque omnipotente numine deduxerit, a cujus nutu rerum ipsarum universitas dependet. Nec magnopere litigandum censeo, quo nomine primum hoc Agens compellandum aut venerandum veniat, cui nomen omne venerabile debetur, sive Deus, sive Natura naturans, sive anima mundi appelletur. Id enim omnes intelligunt, quod cunctarum rerum principium sit et

In describing, however, the phenomena of the egg during incubation, while following the steps of his master, Fabricius ab Aquapendente [o], being struck with admiration at what he conceived the properties of the blood, he imagined that the blood is formed, and is moved, before any vessel or any organ of motion exists; that in it, and from it, not only do motion and pulsation originate, but animal temperature, the vital spirit, and even the principle of life itself; that it is invariably the first thing that lives, and the last that dies; that it exhibits a tremulous motion in the right auricle, after the pulsations of the heart have ceased; that the heart, an organ of posterior formation, is destined only to distribute and circulate it; that being the principal fountain of life, the parts only through which it flows are observed to live; that those parts where it ceases to flow, become pale, torpid, and die, but upon its return become warm, sensitive, and live again; that the phenomena of sensation and motion are observed before the brain is constructed; that poisons do not destroy the principle of life until they reach its primary residence; in other words, until they reach the blood which,

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finis; quod æternum et omnipotens exsistat; omniumque auctor et creator, per varias generationum vicissitudines, caducas res mortalium conservet ac perpetuet; quod ubique præsens, singulis rerum naturalium operibus non minus adsit, quam toti universo; quod numine suo sive providentia, arte, ac mente divina, cuncta animalia procreet." *Exercit.* 50.

[o] "Fabricius, cujus vestigia, in generatione pulli, sequi instituimus," &c. *Exercit.* 54.

flowing through the system, and imparting vitality and heat to every thing, seems all in all, and all in every part[p]. Nor stops he here, but, entirely ab-

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[p] "Is [sanguis] enim est, qui primus in generatione conspicitur. Idque non solum in ovo, sed in omni fœtu animaliumque conceptu, primo contingere mox palam fiet.

"Factus itaque certior ex iis, quæ in ovo et viva animalium dissectione observavi, statuo contra Aristotelem sanguinem esse primam particulam genitalem; et cor esse ipsius organum, circumlationi ejus destinatum.

"Nec sanguis solum pars primigenia et principalis dicendus est, quod in eo et ab eo motus pulsusque principium oriatur; sed etiam, quia in eo primum calor animalis innascitur, spiritus vitalis ingeneratur, et anima ipsa consistit.

"Vita igitur in sanguine consistit (ut etiam in sacris nostris legimus), quippe in ipso vita atque anima primum elucet, ultimoque deficit.

"Quiescente autem corde, motum videas in auriculis superstitem, ac postremo in auricula dextra; ibique tandem cessante omni pulsatione, in ipso sanguine undulationem quandam et obscuram trepidationem sive palpitationem (extremum vitæ indicium) reperias.

"Quibus clare constat sanguinem esse partem genitalem, fontem vitæ, primum vivens et ultimo moriens, sedemque animæ primariam; in quo, tanquam in fonte, calor primo et præcipue abundat vigetque; et a quo reliquæ omnes totius corporis partes calore influente foventur et vitam obtinent.

"Propterea sanguis ubique in corpore reperitur; nec uspiam id acu pungere vel minimum scalpere queas, quin sanguis ocius profluat: tanquam, absque eo foret, nec calor partibus nec vita superesset. Ideoque, concentrato fixoque leviter sanguine (Hippocrates αποληψιν των φλεϐων nominavit) veluti in lipothymia, timore, frigore externo, et febrium insultu contingit, videas illico totum corpus frigescere, torpere, et pallore livoreque perfusum languescere: evocato autem rursus sanguine per adhibita fomenta, exercitia, aut animi passiones, gaudium nempe,

sorbed by this favourite theory, he maintains that the blood, while flowing in the veins, and perfused with a species of divine heat, totally different

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iramve, hui! quam subito omnia calent denuo, florent, vigent, splendentque!

“Sanguis denique totum corpus adeo circumfluit et penetrat, omnibusque ejus partibus calorem et vitam jugiter impertit, ut anima primo et principaliter in ipso residens, illius gratia, *tota in toto, et tota in qualibet parte* (ut vulgo dicitur) inesse merito censeatur.

“Ex dictis itaque apparet sanguinem esse partem primam genitalem, unde anima primario emicat, et ex qua efformatur prima pars fœtus animata, principium reliquarum omnium tum similarium tum dissimilarium; quæ inde calorem vitalem nanciscuntur, illique subserviunt: cor autem in eum duntaxat finem exstructum esse, ut perpetua pulsatione, venarum arteriarumque ministerio, sanguinem hunc accipiat, eundemque quoquoversum per totum corpus propellat.

“Patetque hoc idem luculentius, quia nec in omnibus animalibus, neque omni tempore cor pulsans reperitur; cum sanguis tamen aut ejus analogon in nullis unquam desideretur.” *Exercit.* 51.

“Quippe, ut modo diximus, priusquam corporis quidpiam visu discernitur, sanguis jam genitus et auctus est, *palpitatque,* ut Aristoteles ait, *intra venas, pulsuque simul quoquoversum movetur; solusque omnium humorum sparsus per totum corpus animalium est. Et semper, quamdiu vita servatur, sanguis unus animatur et fervet.*

“Ideoque concludimus sanguinem per se vivere et nutriri; nulloque modo ab alia aliqua corporis parte vel priore vel præstantiore dependere.

“Quinetiam venena, quæ forinsecus nobis adveniunt, ut ictus venenati, nisi sanguinem inficerent, damnum nullum afferrent.

“Quidni pari ratione affirmemus animam esse in sanguine; cumque hic primo ingeneretur, nutriatur, et moveatur, ex eodem quoque animam primum excitari et ignescere? Certe sanguis

from ordinary heat, though somewhat analogous to the element of the stars, exhibits properties so extraordinary, that, viewed as a spirit, it may justly be termed the hearth-fire, the Vesta, the household divinity, the sun of the microcosm, the calidum innatum, the fire of Plato; and deservedly, he says, may it claim the name of spirit, as abounding more than all the other parts in the radical moisture, that first, that last, that primary element, by which it is not only nourished itself, but which it prepares and imparts liberally to the system around it, pervading constantly for that very purpose every part of the body, that it may thereby unite to itself, nourish, cherish, and preserve alive, the organs which it fabricates, performing that office in a manner not unlike to that of the planets, and more especially of the sun and moon, which, wheeling perpetually round in their orbits, impart their heat and their vivifying influence to every thing below[q].

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est, in quo vegetativæ et sensitivæ operationes primo elucent: cui calor, primarium et immediatum animæ instrumentum, innascitur: qui corporis animæque commune vinculum est: et quo vehiculo anima omnibus totius corporis partibus influit." *Exercit.* 52.

[q] "Ut igitur clarius constet virtutes illas præclaras, quas spiritibus et calido innato viri docti attribuunt, uni sanguini convenire: præter ea, quæ in ovo, antequam quidpiam fœtus appareat, et in fœtu perfecto adultoque mirifice conspicua sunt; pauca hæc diligenti animo perpendenda veniunt. Sanguis nempe extra venas absolute et per se consideratus, quatenus est elementaris, atque ex diversis partibus, tenuibus scilicet serosis, crassis et concretis, componitur, cruor dicitur, paucasque ad-

Scaliger, Fernelius, and others, he says, not duly considering these extraordinary properties of the blood, but viewing it as a compound, and incapable of possessing any powers superior to those of the simple elements or of the mixed substances of which it is composed, have imaged to themselves, as a more excellent and more divine *calidum innatum*, some other spirit, aerial, æthereal, or composed of something elementary or æthereal; believing that such would be much better calculated than the blood to be the immediate instrument of the *anima* in its operations. They, accordingly, have supposed, that besides the blood there is another spirit, another heat of divine origin, a simple substance most uncompounded, most subtile, most at-

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modum et obscuras virtutes possidet. In venis autem exsistens, quatenus est pars corporis, eademque animata et genitalis, atque immediatum animæ instrumentum, sedesque ejus primaria; quatenus etiam corpus aliud divinius participare videtur, et calore animali divino perfunditur; eximias sane vires obtinet, estque analogus elemento stellarum. Quatenus spiritus, est focus, Vesta, lar familiaris, calidum innatum, sol microcosmi, ignis Platonis; non quod, ignis communis instar, luceat, urat, et destruat; sed quod vago ac perpetuo motu se ipsum conservet, nutriat et augeat. Spiritus etiam nomen meretur, quatenus humido radicali, ultimo scilicet proximoque alimento, primario et præ aliis partibus abundat; cæterisque omnibus eundem victum, quo ipsemet nutritur, et parat, et exhibet: dum nempe perpetim universum corpus peragrat, partesque omnes, quas ipsemet fabricat sibique adjungit, nutrit, fovet, ac in vivis sustentat: non aliter certe quam superiora astra, sol præsertim et luna, servatis perpetuo circuitibus, inferiora ista vivificant." *Exercit.* 71.

tenuated, most mobile, most rapid in its motions, and most lucid; in short, an æthereal substance partaking of the nature of the fifth essence. But they never, he says, have been able to demonstrate that such a substance any where exists; or, if it existed, that it would possess any powers superior to those of the elements, or perform greater things than the blood is capable of performing by itself. As for my part, says Harvey, who, in my inquiries, take the senses for my guide, I have never been able to discover such a substance[r]. Carrying on, or rather carried on by his train of ideas, he begins at last to imagine, that the blood is the animating principle, or the substance of which the *anima* or life is only the act[s]. On this hypothesis he asserts, that the blood appears to differ in nothing from the *anima*, and that what he had already conceived to be a principle distinct from the blood, appears now to be little more than an act of that fluid. On this change of his sentiments, he considers the *anima* neither as a body nor as entirely without a body, but as something partly derived from without, and partly, at the same time, produced within; in some sense a part of the body, and in some sense the principle and the cause of all that is contained in an animal body, the cause of nutrition, of sense, and of motion, the cause not only of life but of death, as nothing can be said to die that has not lived, and nothing to live that has not been nourished. And hence, if the *anima* is to be reckoned the cause of every thing occurring in the body, the cause of youth and of old age, of sleep, of watchfulness, and of respiration, so also ought the blood; and, therefore, it amounts to the same thing whether you say that the *anima* and the blood, or the blood with the *anima*, or the *anima* with the blood, are the causes of every thing in the animal economy[t].

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[r] "Scaliger, Fernelius, aliique, sanguinis eximias dotes minus perpendentes, spiritus alios (tanquam præstantius et divinius calidum innatum) aereos aut æthereos, vel ex substantia æetherea et elementari compositos finxerunt, proximumque animæ instrumentum ad omnia maxime idoneum crediderunt: ea potissimum ratione nixi, quod sanguis, utpote ex elementis compositus, supra vires elementorum, mistorumque ex iis corporum, agere nequeat. Finxerunt itaque spiritum, caloremque innatum alium, cœlestis originis et naturæ; corpus nempe simplicissimum, subtilissimum, tenuissimum, mobilissimum, velocissimum, lucidissimum, æthereum, quintæque essentiæ participem. Nuspiam tamen demonstrarunt ejusmodi aliquem spiritum dari, aut eundem supra vires elementorum agere, vel majora opera præstare quam sanguis solus possit. Nos sane, qui perscrutandis rebus sensu duce utimur, talem aliquem nullibi invenire potuimus." *Exercit.* 71.

[s] Harvey here plays ridiculously upon the word anima, employing it sometimes to denote the principle or cause of life, and sometimes the phenomena which indicate the presence of that principle.

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[t] "Quoniam itaque sanguis supra vires elementorum agit, dictisque istis virtutibus pollet, atque summi opificis instrumentum est; nemo facultates ejus admirabiles et divinas satis unquam deprædicaverit. Habet profecto in se animam primo ac principaliter, non vegetativam modo, sed sensitivam etiam et motivam: permeat quoquoversum, et ubique præsens est; eodemque ablato, anima quoque ipsa statim tollitur, adeo ut sanguis ab anima nihil discrepare videatur, vel saltem substantia, cujus actus sit anima, æstimari debeat. Talis, inquam, anima est; quæ nec omnino corpus sit, nec plane sine corpo-

As an additional and powerful support of this fanciful opinion, that the *anima* and blood are the same thing, Harvey has appealed to the sacred writings, where the word blood being used symbolically in a variety of different senses, is sometimes denominated the life of the flesh. With equal propriety he might have appealed to the figurative language of Homer and Virgil, where a purple death and a purple life are synonymous expressions, and where the word signifying soul being substituted for the word signifying blood, the soul is described as rushing through a wound, and sometimes as vomited up by the mouth[u]: but, can

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re; partim foris adveniat, partim domi nascatur; aliquo modo sit pars corporis, aliquo autem modo principium et causa omnium, quæ in corpore animalis continentur; nimirum nutritionis, sensus, et motus; ac proinde vitæ pariter et mortis: quidquid enim nutritur, id ipsum vivit; et vice versa. Similiter quod abunde nutritur idem augetur; quod autem parce nimis, id decrescit: quod etiam perfecte nutritur, sanitatem servat; quod secus, in morbos labitur. Juventutis ergo et senectutis, somni insuper et vigiliarum, atque etiam respirationis, ut anima, ita sanguis quoque causa et auctor æstimandus est: præsertim cum instrumentum primum in naturalibus moventem causam internam in se contineat. Eodem ergo res redit, si quis dicat animam et sanguinem, aut sanguinem cum anima, vel animam cum sanguine, omnia in animali perficere." *Exercit.* 71.

[u] Αἱματοεσσα δε χειρ πεδιῳ πεσε· τον δε κατ' οσσε
Ελλαβε πορφυρεος θανατος και μοιρα κραταιη.
Iliad. E. 83.

ψυχη δε κατ' ουταμενην ωτειλην
Εσσυτ' επειγομενη· τον δε σκοτος οσσ' εκαλυψε.
Iliad. Ξ. 518.

Purpuream vomit ille animam.
Æneid. ix. 349.

any rational person imagine that such phrases were meant by their authors to be interpreted in a literal sense? The scriptures assure us that flesh and blood are to form no part of that body which the soul is to animate beyond the grave; and the two poets, fully aware that their figurative expressions would be generally understood in the sense which they intended, most certainly never dreamed that they would be charged with any inconsistency, when they represented the souls of the dead as inhabiting bodies without any blood[1]. The learned Spencer has clearly demonstrated that the language of scripture respecting the blood was chiefly intended to prevent cruelty, and to deter the people of Israel from adopting certain popular opinions of the heathen idolaters; who, as it appears from Homer, Virgil, and various other writers, believed that demons and the souls of the dead were fond of blood, and that after drinking of what was offered to them in sacrifice, would speak or reveal the secrets of futurity, and satisfy any inquiry of

Ille rapit calidum frustra de volnere telum:
Una eademque via sanguis animusque sequuntur.
Æneid. x. 486.

To explain what is meant by a purple life, Ruæus in his edition of Virgil, in usum Delphini, has subjoined the following note: "Locutio repetita ex veterum quorundam opinione, qui præcipuam animæ sedem statuebant in sanguine: animamque esse ipsum sanguinem etiam nonnulli putabant."

[1] Exsanguis umbræ. Æneid. vi. 401.

their votaries respecting the affairs of this upper world[y].

Harvey's language concerning the blood appears to have originated from a different cause: the important discovery of its circulation had extended his fame widely over Europe; and being warmly attached to a subject which had reflected such lustre on his name and upon his country, the more he thought of it, the more wonderful did it appear to him, till at last considering it as something divine, his judgment no longer having any control over his fancy, he bursts into raptures, and forgetting what he had formerly said of it in the moments of cool observation and reflection, has recourse to hyperboles, and describes its properties in the extravagant language of romance. On his first observations, it appeared to him only an instrument of the *anima*, or that in which the *anima* resided; nor was he then decidedly of opinion that it was its first instrument or its first residence: he had never doubted that it operated by a fluid, but as he could not discover in the egg, prior to incubation, any fluid that resembled blood, he imagined that in its first operations, while forming the yolk in the vitellarium, it might have employed something analagous; a natural and a rational conjecture certainly, for what it then employed was probably a thin, serous, and transparent fluid, as the vessels of an incipient embryo, like the vessels of the lens and the vitreous humour, like those of the cornea, and like many which are ramified on membranes and cartilages, might be too minute to admit the red globules, and consequently invisible. It is more than probable, that by such a fluid, and by such vessels, the animating principle organizes the yolk and the cicatricula, the albumen, its membranes, and the two chalazæ. But in whatsoever way, by whatsoever fluids, or by whatsoever vessels these parts are organized, their organization indicates the presence of an animating principle, and demonstrates that the egg, when even of the size of a mustard seed, is an animated being; the conclusion at which Harvey himself had arrived, before he was fascinated with his theory of the blood.

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[y] See Spencer De Legibus Hebræorum ritualibus, vol. i. p 381, 603. Cantab. 1727, 2 vol. fol. See also Odyss. Λ, 93-148.

It was under the influence of that theory, or rather hypothesis, that he first began to think an egg might be neither an animated being nor yet an inanimate, but something intermediate*, and that he first experienced the difficulty of separating his idea of an animating principle from his idea of visible motion. It is hence that he frequently talks of the processes of organization as commencing with the visible motion of the blood; and as the fluid which he terms blood never makes its appearance, nor is seen in motion till after the incubation is begun, he also not unfrequently dates the existence of the animating principle, not, as he had been previously accustomed, from the series of phenomena which it exhibits in the vitellarium, and oviduct, but from the consecutive part of that series which it exhibits during incubation. On no other supposition whatever could he call the blood the primogenial particle, or the primary residence of the animating principle; and on no other supposition whatever, but that there must be motion and conspicuous motion wherever there is an animating principle, could he have imagined that the egg, prior to incubation, was not decidedly an animated body. If not then an animated body, whither had that animating principle fled, to which he ascribes the formation of the yolk and the cicatricula, the albumen, its membranes, and the two chalazæ? and what is that which in prolific eggs preserves the organism and resists putrefaction? Must there be a succession of animating principles, to renew the processes of organization as often as these processes are suspended? Harvey himself ridicules the idea of such a succession, and maintains that the principle which animates a butterfly is the same that had formerly animated its ovum, its larva, and its pupa[a]. Nor could he who had spent many years of his life in studying the generation of insects[b], fail to remark, that every subordinate animating principle which is destined to act on external objects, through the medium of gross and material organisms, must in a number of its operations depend on external auxiliary agents, as heat, moisture, and supplies of nourishment; and that therefore such principles in seeds and in eggs must often, from the want of such external auxiliary agents, remain inactive, and without exhibiting the phenomena of motion, not to say for hours or for days, for weeks or for months, but sometimes for years.

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* "Est quoque medium inter animatum et inanimatum; neque enim vita prorsus donatum est, neque eadem omnino privatur." *Exercit.* 26.

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[a] See above, p. 442.

[b] "Atque hæc dum agimus, ignoscant mihi niveæ animæ, si, summarum injuriarum memor, levem gemitum effudero. Doloris mihi hæc causa est: cum inter nuperos nostros tumultus, et bella plus quam civilia, serenissimum regem, idque non solum senatus permissione, sed et jussu, sequor; rapaces quædam manus, non modo ædium mearum supellectilem omnem expilarunt; sed etiam, quæ mihi causa gravior querimoniæ, adversaria mea, multorum annorum laboribus parta, e museo meo

The absurd idea which Harvey at times appears to have adopted, and which Cicero has unguardedly imputed to Aristotle, that the vital principle is constantly active, or is a species of continued motion, is not only contrary to what Aristotle thought, but contrary to what he is even at much pains to demonstrate[c]. Nay, Harvey must have seen that it is not only in seeds and in

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summanarunt. Quo factum est, ut observationes plurimæ, præsertim de generatione insectorum, cum reipublicæ literariæ, ausim dicere, detrimento, perierint." *Exercit.* 68.

[c] See Cicero quoted above, p. 56. See also the third chapter of the first book Περι Ψυχης, where Aristotle shows that the animating principle is not motion, and where he decidedly argues against those who suppose it to be motion. The following are the remarks on Cicero's explanation of Aristotle's meaning, by Julius Pacius, the learned translator of the treatise Περι Ψυχης· "Non solum falsa, sed etiam inepta et ridicula est expositio M. Tullii. - - - Apparet, sententiam illam, quæ ex continuo et perpetuo motu declarat animæ essentiam, non esse Aristotelis, sed veterum illorum, contra quos Aristoteles superiori libro disseruit." Aristoteles de Anima, p. 233. Hanoviæ, 1611, 8vo.

eggs, and in the pupæ of insects, that animating principles are found inactive, but also in organisms that have arrived at their ultimate perfection. The animating principles of certain mosses suspend their operations sometimes for years, if not supplied with the necessary moisture: and the animating principles of many of the nobler species of plants, of many insects, reptiles, and amphibia, and even of warm-blooded animals that hibernate, are found annually to suspend most of their visible operations during a certain portion of the year, when the food is scanty, the moisture congealed, or the temperature unsuitable. From this statement of facts, it must be evident that the animating principles of plants and animals depend not either on moisture or heat for their existence, but require them only as accessory agents in conducting their processes of organization.

Admiring, however, and justly admiring the genius of Harvey, and naturally entertaining a high respect for his opinions, a few of his countrymen felt anxious to know what particular effects medicines would have, if directly introduced into what he supposed the fountain of life, and the primary residence of the animating principle. Their experiments were at first confined to injections of small quantities of medicated waters into the veins of the lower animals. Dr. Lower claims the merit of being the first who thought of injecting a much more congenial fluid, of extracting the whole blood from an animal, and of substituting the blood of others in its stead. In his preparations for such an experiment, he procured a dog of an ordinary size and two mastiffs, and began his operations by opening the jugular vein of the small dog, and by permitting its blood to flow till it ceased to howl, became feeble, and fell into convulsions: he then transfused the arterial blood of one of the mastiffs till the vessels of the small dog were again filled; and thus repeatedly emptying and filling the vessels of the small dog, until he had exhausted the blood of the mastiffs, which consequently died, he closed the incision in the jugular vein of the small dog, which, on being untied, leaped from the table, fawned upon its master, and, to wipe off the blood, rolled upon the grass, as if no particular accident had happened[d]. The report of this experiment having been communicated in conversation to the royal society, by Dr. Wallis, the honourable Mr. Boyle wrote to Dr. Lower, expressing the wishes of the society for a more particular and detailed account of it: that account accordingly appeared in the Transactions of the society, the following December, 1665. The general interest which it excited throughout the continent was much greater than what Lower had foreseen, or considerate men had reason to expect. In France particularly, many eminent practitioners entertained hopes that by this discovery they would be able to prolong life, and even to restore youth to the aged. These hopes were not checked by their patients, who listened as eagerly to their suggestions as the two credulous daughters of Pelias to the prescriptions of the sorceress Medea*. For a time there-

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[d] "Nimirum comparatis canibus, cæterisque quæ ex usu esse videbantur, ex eorum uno mediocris magnitudinis, aperta vena *jugulari*, sanguinem eousque detraxi, donec ejulatu et summa contentione vires jam fatiscere et spasmos imminere satis constaret: deinde ut tanto hujus dispendio alterius sanguine subvenirem, e *cervicali arteria* molossi majoris ad latus ipsius alligati atque compositi sanguinem eousque immisi, usque dum ab irruentis ejus copia sese impleri nimis atque opprimi inquietudine sua rursus fateretur: quocirca arteria *immittente* iterum ligata, e cane *recipiente* rursus sanguinem detraximus, quod alternis vicibus toties repetitum est, donec in duobus majoribus molossis (quorum utriusque sanguinem minor canis exceperat), nec sanguis amplius nec vita superesset: interea ut minor iste, licet tantum sanguinis per vices ipsi detractum sit immissumque, quantum opinor totius corporis pondus æquaret, *jugulari* tamen consuta, et vinculis, quibus detinebatur, solutis, a mensa protinus desiliit, et quasi injuriarum oblitus mox domino suo adblan-

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diri, et quo a sanguine se mundaret, in gramine sese volutare, non aliter omnino neque majore incommodi aut offensæ indicio, quam si in profluentem solummodo conjectus fuisset." Lower, *Tractatus de Corde, &c.* p. 173. Lond. 1670, 8vo.

* Stringite, ait, gladios: veteremque haurite cruorem;
Ut repleam vacuas juvenili sanguine venas.
Ovid. Met. lib. vii. 333.

From this language of Ovid, it is not to be imagined that he had formed the most distant idea of the art of transfusion as practised by Lower, that art evidently implying a previous knowledge of the circulation. The daughters of Pelias therefore drew their swords, not to open a vein in their father, but to cut him in pieces. Had Medea been in earnest, she would have treated him as she treated Æson, first emptied his veins of their old blood by a wound in the neck, and then caused him to drink her restoratives, or poured them into the wound whence the blood was discharged.

fore, all former distinctions between noble and ignoble blood were entirely forgot, or at least disregarded. A few ounces from the veins of a plebeian, or from the arteries of a calf or a sheep, were found to improve the qualities of blood that had flowed through the veins of a long and illustrious series of ancestry; a blood that was supposed, upon the authority of novelists and poets, to have stimulated that ancestry to all its deeds of distinction and renown. At last, however, the unfortunate result of some experiments incautiously performed, or performed upon persons who were not likely to derive any benefit from a change of their fluids, occasioned an order from the French king, and another from the Pope, prohibiting all such experiments in future[f]. The experiments, however, which were then performed, were sufficiently numerous and sufficiently varied, to convince physiologists that transfusion of blood is not accompanied by metempsychosis, or a transmigration of the animating principle[g]; that this principle, although it imparts properties to the blood, imparts no part of itself; and that it has power to conduct its operations not only by blood of its own formation, but by any other blood of nearly the same temperature and fluidity, although formed by a principle of even a different species or genus.

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[f] Halleri Elementa Physiologiæ, vol. i. p. 235. Lausannæ, 1757, 8 vol. 4to.

[g] "Nunc quod porro tradituri sumus, *de ipsius transfusione ex hoc in aliud animal* nescio ante triennium proxime elapsum, an cuiquam injecta sit aut perficiendi spes aut experiendi cogitatio. Nam et postquam in publicum proposita res est tanquam magnos usus in medicina habitura; plerique tamen operis difficultate absterriti et novitate perculsi, aut manus ab experimento abstinebant prorsus, aut frustra admovebant: ut tandem veluti obsoleta *Pythagoræ* fabula, et vanior altera μετεμψυχωσις optari potius ab inconsultis quam a sapientibus sperari videretur." Lower, *Tractatus de Corde, &c.* p. 170.

Harvey himself, fully aware that many of those extraordinary properties which he had chosen to ascribe to the blood, might partly, or rather principally, be owing to what he has styled its *calidum innatum*, has also ascribed most wonderful virtues to the *calidum innatum;* which, as he supposes, is a species of heat totally different in its operations from ordinary heat[h], and which, sometimes rejecting, but oftener adopting the opinion of Aristotle, he in general believes to be a something that is analogous to the element of the stars; an element which, according to Lucilius Balbus, is warm and pellucid, the most pure, the most mobile and unmixed part of æther[i]. Of all the phe-

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[h] See note [q], p. 447, and note [l], p. 464.

[i] In treating of the calidum innatum, Harvey seems to have borrowed not only a number of the ideas, but also several of the expressions which Cicero attributes to Lucilius Balbus, while defending the doctrines of the stoical philosophers.

" Jam vero venæ et arteriæ micare non desinunt, quasi quodam igneo motu; animadversumque sæpe est, cum cor animantis alicujus evulsum, ita mobiliter palpitaret, ut imitaretur igneam celeritatem. Omne igitur, quod vivit, sive animal, sive terra editum, id vivit propter inclusum in eo calorem. Ex quo intelligi debet, eam caloris naturam vim habere in se vitalem per omnem mundum pertinentem.

" Atque id facilius cernemus, toto genere hoc igneo, quod tranat omnia, subtilius explicato. Omnes igitur partes mundi tannomena of living bodies, there was none that had so much attracted the attention of the ancient philosophers as this *calidum innatum*; or as Cicero terms it, this calor inclusus. Whatever lives,

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gam, quæ maximo calore fultæ sustinentur: quod primum in terrena natura perspici potest. Nam et lapidum conflictu atque tritu elici ignem videmus; et recenti fossione

terram fumare calentem ;

atque etiam ex puteis jugibus aquam calidam trahi et id maxime hibernis fieri temporibus, quod magna vis caloris, terræ cavernis contineatur; eaque hieme sit densior: ob eamque causam calorem insitum in terris contineat arctius.

" Longa est oratio, multæque rationes, quibus doceri possit, omnia, quæ terra concipiat, semina, quæque ipsa ex se generata stirpibus infixa contineat, ea temperatione caloris et oriri, et augescere. Atque aquæ etiam admistum esse calorem, primum ipse liquor, tum aquæ declarat effusio; quæ neque conglaciaret frigoribus, neque nive pruinaque concresceret, nisi eadem se, admisto calore liquefacta et dilapsa, diffunderet. Itaque et aquilonibus reliquisque frigoribus adjectis durescit humor; et idem vicissim mollitur tepefactus, et tabescit calore. Atque etiam maria agitata ventis ita tepescunt, ut intelligi facile possit, in tantis illis humoribus inclusum esse calorem. Nec enim ille externus et adventitius habendus est tepor, sed ex intimis maris partibus agitatione excitatus: quod nostris quoque corporibus contingit, cum motu atque exercitatione recalescunt. Ipse vero aer, qui natura est maxime frigidus, minime est expers caloris. Ille vero et multo quidem calore admistus est; ipse enim oritur ex respiratione aquarum: earum enim quasi vapor quidem aer habendus est. Is autem existit motu ejus caloris, qui aquis continetur: quam similitudinem cernere possumus in iis aquis, quæ effervescunt subditis ignibus. Jam vero reliqua quarta pars mundi, ea et ipsa tota natura, fervida est, et cæteris naturis omnibus salutarem impertit, et vitalem calorem. Ex quo concluditur, cum omnes mundi partes sustineantur calore, mundum etiam ipsum simili parique natura in tanta diuturnitate servari; eoque magis, quod intelligi debet, calidum illud atque igneum

says Lucilius Balbus, be it animal or plant, lives in consequence of its calor inclusus. This calor was considered by many as a portion of the very powerful and the very hot element of fire, which, according to Hippocrates, being seen and felt without being heard, governs the universe, and regulates every thing agreeably to nature; in it is life, in-

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ita in omni fusum esse natura, ut in eo insit procreandi vis, et causa gignendi, a quo et animantia omnia, et ea, quorum stirpes terra continentur, et nasci sit necesse, et augescere.

"Atque hac mundi divinitate perspecta, tribuenda est sideribus eadem divinitas; quæ ex mobilissima purissimaque ætheris parte gignuntur; neque ulla præterea sunt admista natura, totaque sunt calida atque perlucida: ut ea quoque rectissime et animantia esse, et sentire atque intelligere, dicantur. Atque ea quidem tota esse ignea duorum sensuum testimonio confirmari Cleanthes putat, tactus, et oculorum. Nam solis candor illustrior quam ullus ignis, quippe qui immenso mundo tam longe lateque colluceat; et is ejus tactus est, non ut tepefaciat solum, sed etiam sæpe comburat; quorum neutrum faceret, nisi esset igneus. Ergo, inquit, cum sol igneus sit, oceanique alatur humoribus, quia nullus ignis sine pastu aliquo possit permanere; necesse est, aut ei similis sit igni, quem adhibemus ad usum atque ad victum; aut ei, qui corporibus animantium continetur.

"Atque hic noster ignis, quem usus vitæ requirit, confector est et consumptor omnium, idemque, quocunque invasit, cuncta disturbat ac dissipat. Contra ille corporeus, vitalis et salutaris, omnia conservat, alit, auget, sustinet, sensuque afficit. Negat ergo esse dubium, horum ignium sol utri similis sit, cum is quoque efficiat, ut omnia floreant, et in suo quæque genere pubescant. Quare cum solis ignis similis eorum ignium sit, qui sunt in corporibus animantium, solem quoque animantem esse oportet, et quidem reliqua astra, quæ oriantur in ardore cælesti, qui æther, vel cælum nominatur." Cicero *De Natura Deorum*, lib. ii. § 9, 10, 15.

tellect, and prudence, watchfulness and sleep, motion, change, diminution, and increase[k]. Nay, Harvey himself was so much struck with the wonderful properties of this element, that in bestowing upon it his eulogiums, he almost forgets what he had previously said of the blood, and begins to think that the blood is entitled to the epithet celestial, only because it contains the *anima*, or something corresponding to the element of the stars, analogous to heaven, the instrument of heaven, and vicegerent of heaven. A little after, however, he supposes that the calor itself, which he also terms celestial and divine, is entitled to these epithets only so far as it is governed by the *anima*, or so far as it is subservient to heaven and the instrument of the supreme being[l].

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[k] Το θερμοτατον και ισχυροτατον πυρ, ὁ περ παντων ἐπικρατεεται, διεπον ἁπαντα κατα φυσιν· αψοφον, και οψει και ψαυσει· εν τουτῳ ψυχη, νοος, φρονησις, αυξησις, κινησις, μειωσις, διαλλαξις, ὑπνος, εγρηγορσις. Hippocrates de Diæta, lib. i. § 11.

[l] "Sunt tria corpora, eaque simplicia, quæ videntur sibi spiritus nomen vel saltem officium præcipue vendicare; nempe ignis, aer, et aqua: et quodlibet eorum vitam, sive corpus aliud participare videtur, ob motum et fluorem perpetuum; flamma, inquam, flatus, et flumen. Flamma est fluxus ignis; flatus aeris; flumen aquæ. Flamma, tanquam animal, se ipsam movet, nutrit, auget, vitæque nostræ symbolum est. Ideoque in ceremoniis divinis passim usurpatur; in templis quoque Apollinis et Vestæ a virginibus religiose, ceu res sacra, custodiebatur: eundemque ab ultima antiquitate apud Persas, aliasque gentes plurimas, divino honore cultum accepimus. Quasi Deus in igne maxime conspicuus sit, et ex igne nobis, ut olim Mosi, loqueretur. Aer etiam suo merito spiritus dicitur, siquidem hic

But, after this, what are we to think of the *anima* of Harvey? It is sometimes the blood, sometimes this *calidum innatum*, and sometimes a being that existed before them and generated both. Had he steadily adhered to the first account, to the result of his own observations, and been less anxious to describe the blood as something miraculous, and yet not as miraculous without its heat or *calidum innatum*, he had not fallen into such inconsistencies. He would not first have described the blood as an instrument of the *anima*, and then the *anima* as an act of the blood: he would not have censured Fernelius and Scaliger for maintaining that the blood, in performing its functions, is assisted by something like the element of the stars, and yet afterwards have strenuously supported that opinion. In his later days he seems to have drawn more of his conclusions from read-

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a spirando nomen sumpsit; et Aristoteles disertis verbis fatetur, *vitam quandam, atque ortum et interitum vel flatuum esse.* Denique et fluminis aqua viva appellatur.---- *Αιμα, το ζωτικον του ανθρωπου*, inquit Suidas; quod de reliquis quoque animalibus verum est. Idque etiam Virgilius videtur voluisse ubi ait:

Una eademque via sanguisque animusque sequuntur.

"Sanguis itaque est spiritus, ob eximias ejus virtutes et vires; est etiam cœlestis; siquidem in illo spiritu hospitatur natura, nempe anima, respondens elemento stellarum; id est, aliquid cœlo analogum, cœli instrumentum, cœlique vicarium.

"Similiter et sanguinis calor est animalis, quatenus scilicet in operationibus suis ab anima gubernatur; est etiam cœlestis, utpote cœlo subserviens; et divinus, quod Dei optimi maximi instrumentum sit." *Exercit.* 71.

ing than from thinking; and as appears from the passages cited, to have adopted, without consideration, not a few of the ancient opinions concerning the blood and the *calidum innatum*. It is well known, that among the ancients there were some who ascribed life to the one, and some to the other, while a third class ascribed it to a principle totally different from either. Harvey at first ascribed it entirely to such a principle, but afterwards vacillated between it and the blood, and the *calidum innatum*.

Prior to the period in which Galen demonstrated that the arteries were blood-vessels, this *calidum innatum*, now generally denominated animal temperature, from its being supposed of celestial origin, and to have its residence in the left ventricle belonging to the heart, gave to the heart, and particularly to that ventricle, the honour of being considered as the seat of intellect, contemplation, and feeling; the place of all our thoughts and affections; the place from which this celestial principle regularly distributes its salutary influence to the rest of the system through the medium of the arteries, which at that period were supposed to be air-vessels. Besides, as the windpipe was observed to be the organ through which air is received into the body, it was also called an artery, though from the inequalities appearing on its surface it was usually distinguished from the other arteries by the epithet *tracheia* [m], signifying rough. Through this artery and its numerous ramifica-

[m] Τραχεῖα.

tions in the lungs, the left ventricle, the aorta, and its branches, were supposed to be furnished with regular supplies of air and heat; while, in order to explain how heat could be thus communicated by air, which was reckoned among the coldest of bodies, it was asserted that all bodies contain heat either in a sensible or latent state; that air and water owe their fluidity solely to heat; that even solids, however cold, indicate its presence when forcibly rubbed against one another; and that this heat, universally diffused, and every where the cause of growth and nutrition, of sensation and motion, must, from exhibiting phenomena so different from those of common artificial fire, have necessarily proceeded from the sun, moon, or stars; heavenly bodies which, upon the supposition that they were divinities, justly entitled the *calidum innatum* to the epithet divine[n].

That Harvey was partly tinctured with these notions, when describing the effects of the *calidum innatum*, is evident from his language, although many had long before his time begun to suspect that this *calidum innatum* differed in nothing specific or generic from ordinary artificial fire. If they had observed artificial fire suddenly extinguished when excluded from the free access of air, they had also observed the *calidum innatum* as suddenly extinguished when an animal was rendered incapable of breathing. They saw indeed that the degrees of this *calidum innatum* were very different in different species of plants and animals;

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[n] See above, p. 462, note.

this was a circumstance for which they could not so easily account. They saw that plants, insects, and animals of cold blood, sickened or died, when their internal temperature was raised to the same degree as the internal temperature of man; and that man also sickened or died, when his internal temperature was reduced to the same degree as that which in them was an indication of vigour and health. Nay, the ancient Egyptians, who had discovered that heat was every where specifically the same, and that the differences of its effects arose entirely from certain differences in its degrees, its periods of duration, its modes of application; and the species of substances on which it operated, began early to hatch eggs by what is termed artificial heat; a practice which seems to have been the result of much study and considerable art, as Reaumur afterwards, in repeating their experiments, found no small difficulty in regulating the temperatures of the structures erected for that purpose, and in guarding against a variety of circumstances which rendered even the temperature ineffectual.

Since these experiments, the inquiry is not, How many are the species of heat, or what is the species that is best adapted to nutrition, growth, and the other processes of organization? The epithets external, internal, artificial, natural, animal, and vital, as applied to heat, have now no reference to genus or species. The question now is, How does it happen that different species of animals and plants, in conducting their processes of organization, always require their internal heat to be confined to a certain definite number of degrees? Though these degrees be very different in the different species of animals and plants, yet in each species the principle that is employed to regulate them is often observed to preserve them within their specific range, amidst great varieties of external temperature, dryness, and moisture. I say, amidst great varieties, because the power of no subordinate animating principle is found to be unlimited, or capable of maintaining its specific range of internal temperature, quite independently of external temperature. It is hence that those species of plants and animals which are destined to live only in climates where the external temperature is high, must be lodged in houses and cherished by artificial heat, when transferred to countries where the external temperature is low. It is hence that those species which, on the contrary, are destined to live only in climates where the external temperature is low, can seldom be made to live and propagate in those climates where the external temperature is high, from the difficulty and expense of procuring artificial cold of sufficient expansion and sufficient duration. It is hence that those species which are found to live in high and low temperatures are also endowed with a certain power of accommodating their integuments, whether fur or bark, to the changes of temperature to which they are subjected. It is true that those species which want this power of accommodation or the power to migrate, when confined to a country where the seasons vary from heat to cold, and the food annually fails for a time, are regularly observed to suspend their processes of organization during the continuance of the adverse seasons, and then to resume them as soon as the favourable seasons return. It is hence that mountains which present varieties of external temperature at different altitudes, present us also with great varieties of animals and plants, some living at the base, some at the middle, and others near the line of perpetual snow; nay, even present us with new varieties at the same altitude, where the temperatures are different on their different aspects, the eastern, western, southern, and northern. It is hence that man, by the changes which take place in his *rete mucosum*, by his superior knowledge of building, by his artificial methods of clothing, and by the art of extricating heat from its latent state and rendering it sensible, is enabled to live in a much greater variety of climates than any other species of animal: and yet, duly reflecting on all those phenomena where heat is concerned, can we deliberately and candidly say that there seems to be any thing in the heat itself that indicates intelligence, design, or foresight, or that entitles it to the epithet divine? Certainly not: if any thing divine, if any thing like power, intelligence, or foresight be indicated by the processes of organization, surely they are not indicated by any of the rude and unconscious materials that we see employed, but by the manner in which these are apportioned, directed, and applied, so as to be all subservient to the end which he who planned, and afterwards caused the structure to be fabricated by an animating principle, had previously contemplated.

SECTION III.

OPINIONS OF WILLIS.

From the high encomiums which Harvey and others have so liberally bestowed on the element of fire and the *calidum innatum*, the learned Dr. Willis, who indiscriminately rests his opinions on hypotheses and facts, is inclined to believe that the animating principle of the lower animals is not the blood, but the *calidum innatum*[o]. As he thinks however that this principle includes a variety of genera and species, he believes with Aristotle that each individual organizes the body in which it resides, and always constructs it to suit the specific and peculiar faculties with which it is endowed, and which it is afterwards to exercise[p]. He agrees also with Harvey in supposing that this principle resides in the blood or circulating fluids [q], denominates it the corporeal soul, describes it as of an igneous nature, and formed of such particles as the body itself, but of the most active, the most subtile, and refined, that belong to the body [r]. In support of his hypothesis he appeals to a great variety of authors ancient and modern, philosophical and medical [s], but states not their opinions with accuracy or fairness. For instance, he has appealed to Hippocrates, who certainly believed that the element of fire was the cause of life and organization, but did not believe that it was a brute unconscious mass of very subtile particles. Hippocrates indeed calls it immortal, and ascribes to it not only motion and sense, but also, in a very eminent degree, every faculty that distinguishes the rational soul: in short, with Hippocrates, it was the Deity who governs the universe, by his power, omnipresence, intelligence, and foresight[t]. In the same loose manner he appeals to Aristotle, who labours to show that the element of fire cannot any more than the other elements explain the phenomena of life and organization. Nay, he appeals even to Des Cartes, who was of opinion that the lower animals have no souls at all, and that all the appearances which they exhibit of sense and vitality are only deceptions; like the motions of a puppet, the mere effects of mechanism. In short, he considers every author as favouring his hypothesis, who thinks that the cause of the vital phenomena in the lower animals is to perish with their bodies; or, to speak more accurately, is to perish before them, as their bodies exist and continue organized after the vital phenomena have ceased. As he thinks that no substance which is physically divisible can be immortal, and as he imagines that the souls of brutes are physically divisible, on his hypothesis they must be mortal, and must perish with their bodies; but, on the same hypothesis it follows that the spiritual bodies of the saints in heaven cannot be immortal, and that the doctrine of the sacred writings, which plainly declare that mortal bodies can put on immortality, ought not to be received.

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[o] "Quod vero Bruti animam non modo corpoream, et extensam, sed naturæ cujusdam igneæ, ejusque actum, sive subsistentiam, aut flammam, aut halitum flammæ proximum, et affinem esse statuerim, præter authorum tum veterum, tum recentiorum testimonia amplissima, insuper rationes et argumenta fere apodictica me induxerunt." Willis *De Anima Brutorum, pars physiologica*, cap. ii.: Opera Omnia, Amst. 1682, 4to.

[p] "Quod vero spectat ad animæ corporeæ operationes in genere, advertimus eam, quam primum actu existit, hæc duo præcipua munia obire; primo scil. corpus quasi domicilium suum effingere, et dein corpus illud integre formatum, ad usus quosvis tum speciei, tum individuo necessarios aptum, et accommodatum reddere." Ibid.

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[q] "Non paradoxum erit statuere, animam in sanguine aut liquore vitali gliscentem, aut ignem aut flammam quandam esse." Ibid.

[r] "Opinari fas sit animam brutalem particulis ejusdem materiei, e qua corpus organicum formatur, iis vero selectis, subtilissimis, et maxime activis constare, quæ tanquam flos, e crassiori massa emergentes, mutuo coeunt, atque ductus idoneos, quos per totam corporis compagem ipsæ procedunt, nactæ, hypostasin unam continuam, scilicet prætenuem, et quasi spirituosam, toti adæquatam, et coextensam constituunt." Ibid.

[s] "Quod ad aliorum vero suffragia attinet, ne unius Gassendi, qui hypothesin hanc tuetur, vestigiis insistere videar; hic plerosque antiquiores tum medicos, tum philosophos, citare possim. Nam ut Democritum, Epicurum, Laertium, Lucretium, eorumque sectatores prætercam; Hippocrates, Plato, Pythagoras, Aristoteles, Galenus, cum multis, utut circa alia discrepantes, in hanc sententiam, scilicet animam aut ignem aut quoddam ei analogum esse, junctis quasi manibus iverunt: quibus item e modernis Fernelius, Heurnius, Cartesius, Hogolandus, aliique se adjunxerunt: et nuperrime honoratus Faber, Tract. de generat. Animal. bruti animam corpoream, ejusque substantiam ipsummet ignem esse verbis expressis tradidit." Ibid.

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[t] See above, p. 82, note.

Willis was probably not aware that, while under the influence of Christian piety and Christian zeal, he was arguing like an atheist, proceeding uniformly on the supposition, that simple substances not physically divisible exist necessarily and independently of the will of the deity; and that compound substances are necessarily and independently of the will of the deity ultimately decomposed. But, can such a hypothesis be deemed the result of much inquiry or of deep reflection? If the animating principle in a seed of grass can by the exertion of a few of its energies resist, amidst a variety of circumstances, the dissolution and corruption of its body for a number of years, how foolish and absurd is it to imagine that the author and the preserver of all, an eternal, omnipotent, and omniscient being, could not, if he willed it, be able to render such a body immortal?

Even admitting that the element of heat can perform all the miracles which Willis has ascribed to it, he ought to have shown how it came to be divided into genera and species, and how the species, in organizing their several structures, differ so widely from one another in their modes of operation; nay, differ not only from one another, but from the heat of the sun and moon, and of what is termed artificial fire. After all, we must say, notwithstanding these defects, that the treatise De Anima Brutorum justly merits the attention of the anatomist and physiologist. It contains a variety of useful observations, displays much reading, much study, and practice in dissection; and was written by one of the most benevolent and upright of men.

SECTION IV.

OPINIONS OF MR. HUNTER.

Mr. Hunter, whose mind was not, like the minds of Harvey and Willis, stored with much of the riches of literature, has seldom appealed to the writings or the opinions of others. Most of his opinions are founded on his own observations and experiments; opinions which, although he and his friends might have thought them original, as proceeding directly and immediately from himself, are not however always to be deemed original in such a sense as to be termed either new or uncommon. Thus, suspecting that an egg might have the power of self-preservation without any apparent motion or any visible organization, he subjected to the heat of 103° a hen's egg for three weeks and a duck's egg for four; and having observed that the yolk regularly, when the egg was prolific, continued *sweet* during these periods, and when not prolific, became putrid in nearly the same time as any other dead animal matter, he inferred from the experiment, not only that a prolific egg has the power of preservation, or a principle of life, but that organization and life do not depend in the least on each other; that organization may arise out of living parts and produce action, but that life never can arise out of, or depend on organization[u]. Seemingly afraid that any other person should claim a priority in performing these experiments, or in drawing these conclusions, he takes the trouble to inform us that they had occurred to him about the year 1755 or 1756.

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[u] "It is within these fifty years only that the callus of bones has been allowed to be alive; but, I shall endeavour to show that organization and life do not depend in the least on each other; that organization may arise out of living parts and produce action, but that life can never rise out of, or depend on organization. An organ is a peculiar conformation of matter (let that matter be what it may) to answer some purpose, the operation of which is mechanical; but, mere organization can do nothing, even in mechanics; it must still have something corresponding to a living principle, namely, some power. I had long suspected that the principle of life was not wholly confined to animals, or animal substances endowed with visible organization and spontaneous motion: I conceived that the same principle existed in animal substances devoid of apparent organization and motion, where there existed simply the power of preservation.

"I was led to this notion about the year 55 or 56, when I was making drawings of the growth of the chick, in the process of incubation. I then observed, that whenever an egg was hatched, the yolk (which is not diminished in the time of incubation) was always perfectly sweet to the very last; and that part of the albumen, which is not expended on the growth of the animal, some days before hatching, was also sweet, although both were kept in a heat of 103° in the hen's egg for three weeks, and in the duck's for four. I observed, however, that if an egg did not hatch, it became putrid in nearly the same time with any other dead animal matter; an egg, therefore, must have the power of self-preservation, or in other words, the simple principle of life." Hunter's *Treatise on the Blood, Inflammation, and Gun-shot Wounds*, p. 78. Lond. 1794, 4to.

But, granting that they had, and that some of his contemporaries had really anticipated him in these discoveries, he might in his turn have deprived them of their claim to priority, as these experiments had a hundred years before been performed by Harvey, and likewise all these conclusions drawn [x], excepting the one that organization and life do not depend in the least on each other; a conclusion which unfortunately is contradicted rather than warranted by the premises on which it is made to rest.

From his own ignorance, and from the ignorance, or perhaps the delicacy of his friends, his pupils, and his acquaintances, he appears also during a great part of his life, and even until his death, to have laboured under the singular delusion that he himself was the first person who had ever dreamed of vitality in the blood [y], and the first who had attempted to confirm it by experiments; and yet the observations and experiments which he made with that view are neither so numerous nor so forcibly stated as those which had previously been made by Harvey. In adopting however, such a hypothesis, he displayed the native energy of his mind and an honourable candour, having adopted it in opposition to his prejudices and habits; for he tells us that his mind had not been accustomed to the idea of a living fluid, and that his ideas of life had been so much connected with organic bodies, and principally those endowed with visible action, that it required a new bend to make it conceive that these circumstances are not inseparable [*].

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[x] "Ovum itaque est corpus naturale, virtute animali præditum; principio nempe motus, transmutationis, quietis, et conservationis." Harveii *Exercit.* 26.

[y] "That the blood has life, is an opinion I have started for above thirty years, and have taught it for near twenty of that time, in my lectures; it does not, therefore, come out at present as a new doctrine, but has had time to meet with considerable opposition, and also acquire its advocates. To conceive that blood is endowed with life, while circulating, is perhaps carrying the imagination as far as it well can go; but the difficulty arises merely from its being fluid, the mind not being accustomed to the idea of a living fluid." P. 77.

How he was led to contract these habits and adopt these prejudices, he has not informed us; but he certainly was not led by any cool or accurate observations, for who ever perceived in organic bodies any action that indicated life where a fluid was not present, and where that fluid was not in motion? Nor could he have been led by popular opinion, for he must have heard of living water, of devouring flame, and of spirits inhabiting aerial bodies in the character of ghosts: nor could he have been led by reflecting on animal and vegetable structures, for all these structures are formed out of fluids; and whatever be the causes of organization, these causes invariably commence their operations in fluids, nay continue them afterwards through the medium of fluids. Nor could he have been led by any opinions of poets or philosophers, for from the earliest periods of history, philosophers and poets, and mankind in general, have in all ages been so regularly accustomed to associate their ideas of a living principle with some idea of internal motion, or a motion arising from invisible causes, that in Aristotle's time, while some physiologists ascribed the phenomena of life to the element of fire, some to the element of air, some to the element of water, there were not any who ascribed them to the earth; and seemingly on account of its being a solid and exhibiting nothing like internal motion; a motion in their minds so closely associated with the vague ideas which they had formed of a principle of life, that many of them thought it not only the effect, but even the cause of the vital phenomena.

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[*] "Our ideas of life have been so much connected with organic bodies, and principally those endowed with visible action, that it requires a new bend to the mind to make it conceive that these circumstances are not inseparable." P. 78.

After all, Mr. Hunter no where appears to have ever been entirely divested of his prejudices in favour of a living power in the solids. He seems to have thought to the very last that a living principle might not only reside in the solids, but even operate upon them directly without the interposition of fluids. What he chiefly contends for is, that there is a principle of life in the blood as well as in the solids, a principle which he calls the *materia vitæ*, and which principally, he says, composes the brain. On this new hypothesis, the brain is the *materia vitæ coacervata*[a], the nerves *chordæ internunciæ*, and the like matter diffused through the blood and the body in general, the *materia vitæ diffusa*[b]; and

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[a] "This shows that no part of the body is to be considered as a complete living substance, producing and continuing mere life, without the blood; so that blood makes one part of the

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compound; without which life would neither begin nor be continued. This circumstance, on its first appearance, would seem a little extraordinary, when we consider that a part, or the whole, are completely formed in themselves, and have their nerves going to them, which are supposed to give animal life; yet that perfect living part, or whole, shall die in a little time, by simply preventing the blood from moving through the vessels: under this idea, it is not clear to me, whether the blood dies sooner without the body, or the body without the blood. Life then is preserved by the compound of the two, and an animal is not perfect without the blood: but this alone is not sufficient, for the blood itself must be kept alive; because, while it is supporting life in the solids, it is either losing its own, or is rendered incapable of supporting that of the body. To accomplish all this it must have motion, and that in a circle, as it is a continuance of the same blood which circulates, in which circle it is in one view supersaturated, as it were, with living powers, and in another is deficient, having parted with them while it visited the different parts of the body. Life is in some degree, in proportion to this motion, either stronger or weaker; so that the motion of the blood may be reckoned, in some degree, a first moving power; and not only is the blood alive in itself, but seems to carry life every where; however, it is not simply the motion, but it is that which arises out of, or in consequence of the motion. Here then would appear to be three parts, viz. body, blood, and motion; which latter preserves the living union between the other two, or the life in both. These three make up a complete body, out of which arises a principle of self-motion; a motion totally spent upon the machine, or which may be said to move in a circle, for the support of the whole: for the body dies without the motion of the blood upon it; and the blood dies without the motion of the body upon it; perhaps pretty nearly in equal times." P. 85.

[b] "This living principle in the blood, which I have endeavoured to show to be similar in its effects to the living principle

yet he abides not long by this opinion any more than by the others. He afterwards thinks that this cerebral matter is not so essential to life as the blood; that life commences even in the chyle; and that when the uterus is enlarged during pregnancy, it is not the nerves, his *chordæ internunciæ*, that increase in size, but the vessels containing the fluids; while these fluids, on another new hypothesis, are supposed to acquire their power of activity from the lungs[c]. On one occasion, when

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in the solids, owes its existence to the same matter which belongs to the other, and is the materia vitæ diffusa, of which every part of an animal has its portion.

"I consider that something similar to the materials of the brain is diffused through the body, and even contained in the blood; between this and the brain a communication is kept up by the nerves; I have therefore adopted terms explanatory of this theory, calling the brain the *materia vitæ coacervata*, the nerves the *chordæ internunciæ*, and that diffused through the body the *materia vitæ diffusa.*" P. 88, 89.

[c] "The uterus, in the time of pregnancy, increases in substance and size, probably fifty times beyond what it naturally is, and this increase is made up of living animal matter which is capable of action within itself. I think we may suppose its action more than double; for the action of every individual part of this viscus, at this period, is much increased, even beyond its increase of size; and yet we find that the nerves of this part are not in the smallest degree increased. This shows that the nerves and brain have nothing to do with the actions of a part, while the vessels, whose uses are evident, increase in proportion to the increased size: if the same had taken place with the nerves, we should have reasoned from analogy. It is probably impossible to say where the living principle first begins in the blood: whether in the chyle itself, or not till that fluid mixes with the other blood and receives its influence from the lungs.

speaking of the blood, he says it is evident that its fluidity is only intended for its motion; its motion only to convey life and living materials; that these materials, when carried to their place of destination, may become solid; and hence he infers that solidity is the ultimate end of the blood, as blood[d].

After coolly reflecting upon this singular variety of hypotheses, it is not surprising that he could not draw any general conclusion from such a chaos of crude, inconsistent, contradictory ideas; and that in searching for the principle of life, upon the supposition that it was the property of something visible, he should have searched for it sometimes in the blood, sometimes in the chyle, sometimes in motion, sometimes in the brain, sometimes in the lungs, and sometimes in other parts of the body, till at last, finding it in none of them exclusively, he concluded that it must be a consequence

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I am however rather inclined to think that the chyle is itself alive; for we find it coagulates when extravasated; it has the same powers of separation with the blood; and it acquires its power of action in the lungs as the venal blood does." P. 91.

[d] "From what has been said with regard to the blood, that it becomes a solid, when extravasated in the body, we must suppose that some material purpose is answered by it; for if the blood could only have been of use in a fluid state, its solidity would not have been so much an object with nature. It appears to me to be evident that its fluidity is only intended for its motion; and its motion is only to convey life and living materials to every part of the body. These materials when carried become solid; so that solidity is the ultimate end of the blood, as blood." Ibid.

of the union of the whole, and depend upon the organism; a conclusion, however, to which he could not, any more than to the others, steadily adhere, after observing that the composition of matter does not give life, and that a dead body may have all the composition it ever had. In such a dilemma, what could he possibly say or conjecture, but that life was a property which he did not understand[e]? and even then might it not be asked how he came to know that it was a property, and not a substance possessing many properties totally different from any of the properties of the visible materials in which he had searched for it? That he did not search for it in the *calidum innatum*, as Harvey and many of the ancients had done, was probably owing to Black's discovery of latent heat, which deprived the *calidum innatum* of much of its mystical air and importance[f]. In short, Mr. Hunter, like a number of others, by confounding cause and effect, seems to have acted like one who, on seeing a complete apparatus consisting of several pieces of machinery, each of them in motion, each of them employed on a different part of the same work, and yet all of them moved by the same impelling cause, should carefully examine each in succession, to discover in which of them the impelling cause resided: or like one who, on seeing the movements of an army, and anxious to trace these movements to their origin, should inquire at every soldier in the ranks, but on being disappointed, should conclude that the movements proceeded from the whole taken as a body: or like one who, on seeing a variety of curious productions in a workshop, but no one to explain them, should, on observing the tools which the artist had employed, proceed to analyse each of them minutely, to discover in which of them he lay concealed. However, from such vague and vacillating notions concerning life and organization, the reader must be told that he is not by any means to form an estimate of the judgment or talents of Mr. Hunter. If he has been inconsistent in treating of these subjects, how few have been consistent! In other respects, who would not wish to be such a man? In a variety of other inquiries more suited to his genius, how few have surpassed him! nay, how few have equalled him! Who has done more for the improvement of the art of surgery? who has personally laboured more for the advancement of comparative anatomy and physiology? and who has left behind him so splendid a monument of skill and of industry, as that museum which is now the pride and boast of his country?

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[e] "But mere composition of matter does not give life; for the dead body has all the composition it ever had: life is a property we do not understand." P. 90.

[f] "Probably every inanimate fluid in nature, which is capable of being rendered solid, produces heat during that change; and in the contrary change cold is commonly known: it is on that principle Dr. Black has established his very ingenious theory of latent heat. Thus, in the freezing of water heat is produced." P. 27.

SECTION V.

OPINIONS OF MR. ABERNETHY.

Mr. Abernethy, who cannot be accused of ignorance or deficiency of intellect, or of being a stranger to the several hypotheses which have prevailed concerning life and organization, has, in preference to the others, adopted that opinion of Mr. Hunter that a principle of life is independent of organization, a something superadded to the organized structure [g]. In defending this opinion, however, he supports it with much modesty and candour; and no where attempts to enforce it by sophisms or dogmatical assertions. Persuaded that no series of facts belonging to any subject is full and complete, he thinks it not impossible that new facts may yet be discovered sufficient to overturn our best established theories [h]. From a writer whose mind is under the influence of such impressions we are not to expect a language that betrays either arrogance or confidence. After modestly therefore stating the arguments on which he has been induced to rest his opinions, he talks of these opinions only as probable, although, from the feelings of a generous and benevolent heart, he could wish to see them generally adopted, being thoroughly convinced that they would be useful, considered even in a moral view. "Thus," he says, "my mind rests at peace in thinking on the subject of life, as it has been taught by Mr. Hunter; and I am visionary enough to imagine, that if these opinions should become so established as to be generally admitted by philosophers, that if they once saw reason to believe that life was something of an invisible and active nature superadded to organization, they would then see equal reason to believe that mind might be superadded to life, as life is to structure. They would then indeed still farther perceive how mind and matter might reciprocally operate on each other by means of an intervening substance. Thus even would physiological researches enforce the belief which I may say is natural to man; that, in addition to his bodily frame, he possesses a sensitive, intelligent, and independent mind; an opinion which tends in an eminent degree to produce virtuous, honourable, and useful actions[1]."

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[g] "I proceed to enquire into Mr. Hunter's opinion, that irritability is the effect of some subtile, mobile, invisible substance, superadded to the evident structure of muscles, or other forms of vegetable and animal matter, as magnetism is to iron, and as electricity is to various substances with which it may be connected.

"The phænomena of electricity and of life correspond." Abernethy's *Enquiry into the Probability and Rationality of Mr. Hunter's Theory of Life*, p. 38, 42. Lond. 1814, 8vo.

[h] "We never can be sure that the series of facts belonging to any subject is full and complete: new ones may be discovered that would overturn our best established theories." P. 13.

An opinion calculated to produce such effects is certainly not one to be lightly esteemed; but as it happens that our present inquiry is not concerning the utility of opinions, but concerning the evidence upon which they are founded, we have here to ask, on what evidence is it supposed that life is superadded to organization? or, more properly speaking, to an organized structure? If the organized structures of the first parents of every species were formed in the first place, and then their vital principles superadded, can it be supposed that this is the manner in which the structures of any of their progeny are now formed? Has any physiologist ever observed an animal or a plant whose visible structure had not been formed by successive processes of organization? or ever seen a process of organization which did not indicate the previous existence of a vital principle? Nay, were we to trust either to the evidence of our sense or our reason, should we not say that, in our days at least, the structure appears to be rather superadded to the vital principle, than the vital principle superadded to the structure? To repeat an observation formerly made, it is upon this hypothesis alone that Cuvier and other naturalists have concluded, that plants and animals which happen to be found in a fossile state had formerly been alive: but the question occurs, what gave them life? or what preceded their organization? Mr. Abernethy supposes a subtile substance of a quickly and powerfully mobile nature, which pervades every thing, and appears to be the life of the world[k]; a substance which he thinks may be considered as a distinct and active principle, not confounded with intelligence of any kind[l]. This notion he ascribes to Mr. Hunter, and Mr. Hunter may have adopted it, but on no account can he be supposed the first who suggested it; for there is scarcely a notion more ancient than that of a general vital principle or *anima mundi*, devoid of intelligence, but diffusing life and motion through the universe by its small abraded particles[m], when supposed to be a solid, or by its emanations[n], when supposed to be a fluid. On that hypothesis, the abraded particles or the emanations constituted the lives; or more properly speaking, the vital principles of animals and plants.

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[1] P. 94.

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[k] "It is not meant to be affirmed that electricity is life. There are strong analogies between electricity and magnetism, and yet I do not know that any one has been hardy enough to assert their absolute identity. I only mean to prove that Mr. Hunter's theory is verifiable, by shewing that a subtile substance of a quickly and powerfully mobile nature seems to pervade every thing, and appears to be the life of the world; and therefore it is probable that a similar substance pervades organized bodies, and produces similar effects in them. The experiments of Sir H. Davy seem to realize the speculations of philosophers, and to verify the deductions of reason, by demonstrating the existence of a subtile, active, vital principle pervading all nature, as has heretofore been surmized, and denominated the *anima mundi*." P. 51.

[l] "What was called the *anima mundi* was however by many considered as a distinct and active principle, and was not confounded with intelligence of any kind.

"Whilst on the one hand I feel interested in oppugning those physiological opinions which tend to confound life with organization, I would, on the other, equally oppose those which confound perception and intelligence with mere vitality." P. 53, 79.

[m] Αποσπασματα. [n] Απορροιαι.

In proceeding to more particular explanations of this mundane soul, some said it was æther, some the element of fire, some the element of air, some the element of water in the form of vapour; some a nutritive principle, some a nutritive and sensitive principle. But, whatever it was, and however much they differed concerning it, in other respects they all agreed that it was something highly attenuated and extremely mobile; that it possessed a plastic power and was the cause of organization in animals and plants. The learned Cudworth, in treating of these different hypotheses, rejects them all but that of a nutritive or vegetative principle, which he terms a plastic nature, and which he supposes not to be a mere vis formatrix, a formative nisus, or a plastic energy, but a vital incorporeal substance, acting under the directions of the deity, and endowed with a number of qualities sufficient to account for all the various phenomena which the ancients ascribed to their vegetative soul, or that soul which some of the moderns have considered as the cause of their automatic or organic life[o]. It has happened indeed, since the fact has been known that oxygenous gas, the electric, magnetic, and galvanic fluids are as generally diffused, and fully as active as the elements of fire, of air, or of water, that several physiologists, to give to their theories a certain degree of novelty and importance, have chosen to select some one of these fluids to account for the phenomena of life. In making their selections, Mr. Hunter and Mr. Abernethy seem to have preferred the electric fluid: "thus," says the latter, "if the vital principle of Mr. Hunter be not electricity, at least we have reason to believe it is of a similar nature, and has the power of regulating electrical operations [p]."

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[o] The passages in Cudworth to which the reader may be referred are in pages 139, 147, 150, 151, 153, 163, 164, 166, 167, 171, and 172 of his *Intellectual System*. Many ignorant persons, assuming to themselves the title of philosophers, from imagining that Cudworth intended to express some new

It is singular that it did not occur to Mr. Abernethy, that the power of regulating electrical operations belongs more properly to an electrician than to electricity, to the agent directing rather than to the material directed. Not confining him however to the supposition that the electric fluid alone is the cause of life, let us take his more comprehensive view, and without attempting to assign any particular cause, let us merely suppose that the cause of life is a subtile substance, of a quickly and powerfully mobile nature, that pervades every thing. On this

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idea by the term *plastic nature,* have sneered at what they have called his hypothesis, though Cudworth only meant to suggest an appropriate expression for conveying a general and common idea which, he says, has had the suffrage of the best philosophers in all ages. (P. 151.) See also above, p. 76, and p. 293, note.

[p] P. 88.

supposition, it may be not only the electric fluid, it may be the magnetic or the galvanic, it may be caloric, it may be the supposed æther of Newton, or it may be that incorporeal substance, that vegetative life, which Cudworth denominates the plastic nature: yet take any or all of them separately or combined, and suppose the whole universally diffused, how is it explained? or how can it be conceived that these unintelligent and unconscious materials may so vary their modes of operation, as to construct the almost innumerable species of organisms to be found in the animal and vegetable kingdoms; each species constructed on a plan, and each plan different from another? Should it be insinuated that the author of nature, without the intervention of subordinate agents, constructs the rudiments of every organism, and that the subtile all-pervading substance is afterwards superadded to complete the work which he had begun; those physiologists who adopt this hypothesis should recollect that every animal and vegetable organism, in its gradual progress from a rudimental to a perfect state, undergoes a variety of regular changes in its form, in its structure, and in the proportions of its different parts. What then regulates these changes? They may indeed, in each organism, be the effects of some specific agent destined to act agreeably to a certain specific series of operations, but they cannot possibly be the effects of any subtile all-pervading unconscious substance, that has not the power of varying its operations according to the laws of each specific structure and form: or granting even that such a substance might be so modified and directed as to produce that variety of effects, yet if it cannot modify and direct itself, we must necessarily suppose that in every organism from first to last, on every change of structure, of form, or proportion of parts, it must be specifically, and not only specifically but individually directed and modified by some being of supreme power who is every where present, always on the watch, supremely intelligent, and not less than omnipotent.

Some indeed, not quite so fond of generalization as to suppose that one unconscious all-pervading substance is sufficient to account for all the varieties of living organisms, and for all the specific diversities of phenomena which they exhibit, are willing to admit no fewer than three animating principles, a nutritive or vegetative, a sensitive and a rational; the first common to all living organized structures, the second to all species of animals, including man, and the last peculiar to man himself: but even this more qualified attempt at generalization is extravagant and absurd. If the same unconscious vegetative principle organizes the whole, how comes it, without a power of discrimination, and without a precise knowledge of circumstances, to vary its operations, so as to produce innumerable diversities of genera and species, and to carry each individual of the species through a definite series of structures and forms? One should have thought, upon the supposition that it is unconscious, and not under the immediate direction of an omnipresent and intelligent being, that it would always operate in the same way, and wherever the materials and circumstances were the same, that all its productions would have the same character. On the supposition that this same vegetative principle organizes animals, how is it that all animals have not a vegetable structure and form? and upon the supposition that there is but one sensitive principle for all animals, how does it happen that they have not all the same kinds of feelings? If it be said that the feelings are modified according to the states and the species of organisms, this only throws us back into the dilemma how to account, on this supposition, for the difference of organisms.

Instead of supposing that one unconscious all-pervading substance organizes every species of animal and plant, and that every animal derives its sensations from one common sensitive principle, would it not be more natural to suppose that every vegetable has a specific organizing principle, and every animal in like manner a specific principle, with specific powers to organize, to feel, and to be guided by specific instincts? and that the individuals of the human species have in like manner a specific principle, not only to organize and to feel, and to be guided by specific instincts, but even to reason within a certain specific range? Reason, observation, and experience combine in support of this opinion, although many physiologists and abstract speculatists, to judge by their language, would insinuate the contrary, and would have us to believe that one subtile unconscious substance is sufficient to begin, or if not to begin, yet if once begun, to carry to perfection all the various species of organisms; and that a common sensitive principle, in the same way, is sufficient to account for all kinds of sensations. But must nature be compelled to accommodate herself to their conceptions and to their inclinations? Is not her right to dictate to them better than their right to dictate to her? When God said, Let there be light, there was light; but can they pretend to any such power? Certainly not: they can indeed, as often as they choose, call spirits from the vasty deep, and so can we, or so can any man; but will they come when either they or we do call for them[q]?

After all, it must be acknowledged, that however absurd may be the hypothesis of a common vegetative and of a common sensitive principle, it appears to have originated from a very laudable and prevalent tendency in thinking men to generalize and concentrate their ideas. It was accordingly countenanced by Plato; and though Aristotle clearly saw its defects, yet, in compliance with general custom, he not unfrequently employs a language that appears to favour it: in short, from some prevalent fashion in our way of thinking, or in other words, from mere imitation, the present language of physiology is so framed upon this hypothesis, that in treating of life and organization, a writer will often experience the difficulty of finding an expression that does not allude to it. Thus, divines, moralists, and physiologists not unfrequently talk of their vegetative, sensitive, and rational faculties; and considering the last as greatly superior to the other two, would have it to be a distinct principle, that is to say, not any portion or faculty of a soul, but a complete soul of itself, and the only species of animating principle that is destined to survive the dissolution of its earthly body. As for what they call the vegetative and sensitive principles, they seem to imagine that any functions which they perform or are capable of performing might be as well performed by automatons; or if not by automatons, by any very mobile and attenuated substance, such as light, caloric, the electric, magnetic, or galvanic fluids. Now, on coolly considering what those powers are, which this rational soul possesses exclusively, and what the actions which it performs, that should entitle it to such eminence and distinction, we must confess that we know of none. Upon the supposition that it is not any portion of a whole, or any faculty or power belonging to a species of animating principle, but a soul or animating principle by itself, and that it may exist totally independent of the other two faculties or souls with which it is connected, let us here be permitted to inquire what it can do or what it can know without the aid of the other two. Can it will, or can it think, without some perception or feeling? or can it reason without any such organism as the brain? Apparently not: so very essential to its operations appears to be some organism or other, that the sacred scriptures plainly inform us that it is to be invested with a bodily organism in its future state, and not merely with an organism, but with an organism through which it is to feel. In this present state it evidently appears to require such an organism, at least it requires a brain to think, a tongue to speak, and a hand to execute what it intends; and not only these, but something also to manage and direct the powers of the organism, of the mechanism of which it seems to know nothing but what it derives through the aid and instruction of the other two. Thus, when it wills a thing to be done, it knows not how that will is to be executed; it knows not what organs, what nerves, what muscles, what veins, what arteries, what glands, and what lymphatics are required to combine, or in what manner they ought to combine in fulfilling its intentions. The execution of its every intention is, on this hypothesis, committed entirely to the other two souls, or the other two faculties, the sensitive and vegetative, which in the lower animals are known to manage similar organisms with adroitness and precision, without the assistance of any supposed rational soul. Nay, while the rational is demonstrably ignorant of the manner in which its intentions are executed, that is to say, of the operations of the other two souls, if we were to reason on any known principles of analogy, we should be compelled to draw the conclusion that the other two souls are by no means ignorant of its intentions, or of any thing it wills or requires to be executed: for how is it possible, if again permitted to reason from analogy, how is it possible that any individual can ever execute the commands of another, without knowing what the other commands or wills to be done? From such a view of the rational soul's existing by itself, without an organism and without sensation, it appears in a more helpless condition than that of an infant, with only a power to will or command, but no power whatever to execute what it wills or commands, while on this hypothesis the vegetative soul, by the wonderful powers which it displays in constructing its organism, and the sensitive soul by its no less astonishing instincts remind us of many attributes of the deity[r].

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[q] See Shakspeare's King Henry IV. part i. act iii. sc. 1.

On the other supposition, that but one species of animating principle exists in any organism; that such a principle has specific powers to organize a structure for itself, suited to the faculties which it is to exercise; and that the animating principle in man has, beside those capacities which bear some analogy to those of other animals, a capacity also for abstract reasoning, a capacity of making moral distinctions, and a capacity of tracing itself and the other wondrous works of creation to a being of supreme power and intelligence, who originally formed, and who continues to uphold the universe: on such a hypothesis, which seems to be confirmed by the more enlarged and considerate views of animated nature, we should certainly avoid the many inconsistencies and contradictions to which we are reduced, by supposing two or more animating principles of a different species in the same organism; and yet, after all, much will remain to baffle conception, and to set human ingenuity at defiance. The way in which the supreme being has bestowed upon us and every other species of animal that singular power by which we can move, by an act of the will, those masses of matter which constitute our bodies, must to us remain for ever inexplicable. The fact however enables us to form some vague idea how he, by a mere act of his will, could call the universe into existence, how he may uphold it without either labour or fatigue, and how, by a mere act of his will, he might again reduce the whole into nothing. In willing any event, however, the difference between him and us is immense. He knows how to execute his will and how to enforce it: we, on the contrary, are not only ignorant but even unconscious of many thousand secret operations which take place in our bodies in consequence of willing. Might we here be permitted to form a conjecture on a subject which so far exceeds our comprehension, to us it might seem, when he called into existence those spirits which inhabit organisms, as if he had said, You inferior spirits require organisms of gross materials to hold communication with the visible and tangible objects around you; and as my will is every where obeyed throughout the extensive regions of space, I have willed that all of you construct organisms suited to the faculties with which I have endowed you; but as I have not bestowed upon you faculties to comprehend their mode of formation, or their mode of acting, I have ordained, that when you shall will, your organisms shall obey, though how they obey you shall never know, being creatures of too limited intelligence to comprehend the wisdom, the power, the ways, and the doings of the Most High.

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[r] "Mas in generando nec consilio nec intellectu utitur: neque homo parte animæ suæ rationali, sed facultate vegetativa generat; quæ non primaria et divinior animæ humanæ facultas, sed infima censetur.

"Quoniam igitur in pulli fabrica ars et providentia non minus elucescunt, quam in hominis ac totius mundi creatione, necesse est fateamur, in generatione hominis, causam efficientem ipso homine superiorem et præstantiorem dari; vel facultatem vegetativam sive eam animæ partem, quæ hominem fabricat et conservat, multo excellentiorem et diviniorem esse, magisque similitudinem Dei referre, quam partem ejus rationalem; cujus tamen excellentiam miris laudibus supra omnes omnium animalium facultates extollimus, tanquam quæ jus et imperium in illas obtineat, cuique cuncta creata famulentur." Harveii *Exercit.* 50.

SECTION VI.

OPINIONS OF DELEUZE ON ANIMAL MAGNETISM.

THAT the fluid termed electric is generally diffused, and a very powerful agent in nature; that the bodies of men and of various animals frequently exhibit electrical phenomena; and that the bodies of some animals, as the gymnotus and the torpedo, contain even electrical batteries, are facts which have long been known and established. It is also generally known and admitted that this fluid, in certain circumstances, and under particular modes of management, confers a magnetic power upon iron, and gives a polarity to many bodies over which the magnetic and galvanic fluids seem to exert no influence whatever. Its power however of giving polarity to certain bodies has not, at least so far as I know, been noticed by any British physiologist, in his attempts to illustrate the progress of organization by electricity. The idea which is here meant to be conveyed by the term *polarity* is illustrated by the magnetic needle, one end of which invariably points to the north pole, while the other as regularly points to the south; the one end always repelling what the other attracts. In allusion to these phenomena of the magnet, a body is said to be polarized, when one of its sides or one of its extremities is found to repel what the opposite side or extremity attracts, although, as in the magnet, the attraction and repulsion be not in a southerly or northerly direction. Taking polarity in this sense, Newton observed something resembling it in the particles of light; and Sprengel has ascribed that polarity, as well as the polarities which he has attributed to sound and caloric, entirely to magnetism: and so partial is he to this magnetism, that he thinks the electric and galvanic fluids derive from it alone the powers which they possess of polarization; that the influence of magnetism is universal; that it does not extend merely to iron and a few other metals, but to almost every terrestrial substance when reduced to the state of very minute particles[s]. But whether this power of imparting polarity belongs exclusively to magnetism or not, we shall not inquire, as Sprengel no where pretends that his magnetism can organize an animal or a plant, or indeed exhibit any other phenomena of a vital principle.

As to animal magnetism, there may be doubts whether any such fluid actually exists, and whether the known effects of the mind and that influence which it exercises over the body, may not account for all the phenomena which have been ascribed to it. It is chiefly, therefore, as illustrative of the mind, that its history to many will appear either entertaining or instructive. That history has been written by Deleuze, who is a magnetizer himself, and who cannot be accused of underrating the merits of a cause to which he imputes such remarkable phenomena. According to him, this magnetic fluid has occasionally been observed like a luminous atmosphere surrounding the bodies of the magnetizers, and issuing principally from their heads and their hands, although the magnetizers themselves never see it; it appears only to the magnetized, and to them only when they are asleep, newly awakened, or becoming drowsy. The magnetizers have, nevertheless, the sole command of it, and they command it by certain voluntary motions of the hands, or without these motions, often by a mere act of the will[t]. The will however upon these occasions must not only be active and benevolently inclined, but must also be accompanied with a firm belief in the efficacy of the magnetism, and more particularly with a steady conviction of that efficacy, while directing its efforts towards the patient[u]. Some small degree of faith is also required of the magnetized, as their incredulity has frequently been found to disturb the magnetizer, and to frustrate his intentions [v]. For these reasons, persons wishing to be magnetized from mere curiosity should never be indulged [x].

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[s] "Sigillatim tractanda sunt *imponderabilium* genera, [scilicet magnetismus, lux, calor, sonus, electricitas, galvinismus.] Ut a magnetismo ordiar, esse eum vis universalis attractivæ et expansivæ modum quemdam aut potentiam, vel inde patet, quod non ferro soli, nec paucis quibusdam metallis, sed omnibus fere terrestribus corporibus, si modo tenuissime secta fuerint, tribui possit." Curtii Sprengel *Institutiones Medicæ*, tom. i. p. 124. Amst. 1809, 2 tom. 8vo.

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[t] "C'est aux somnambules magnétiques que nous devons toutes les notions que nous avons acquises sur ce fluide: on ignore toujours s'il est une modification du fluide universel; mais on ne peut guère douter de son existence.

"La plupart des somnambules voient un fluide lumineux et brillant environner leur magnétiseur, et sortir avec plus de force de sa tête et de ses mains. Ils reconnoissent que l'homme peut à volonté accumuler ce fluide, le diriger, et én imprégner diverses substances. Plusieurs le voient non-seulement pendant qu'ils sont en somnambulisme, mais encore quelques minutes après qu'on les a réveillés: il a pour eux une odeur qui leur est agréable, et il communique un goût particulier à l'eau et aux alimens.

"Quelques personnes aperçoivent ce fluide lorsqu'on les magnétise, quoiqu'elles ne soient point en somnambulisme; j'en ai même rencontré qui l'apercevoient en magnétisant: mais ces cas sont extrêmement rares." Deleuze, *Histoire Critique du Magnétisme Animal*, partie i. p. 82. Paris, 1813, 8vo.

[u] "Le magnétisme exige
volonté active vers le bien;
croyance ferme en sa puissance;
confiance entière en l'employant." Ibid. p. 56.

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[v] "La foi est nécessaire au magnétiseur, sans elle il agira foiblement; mais elle n'est point nécessaire à celui qu'on magnétise. Si celui-ci n'éprouvoit des effets qu'autant qu'il est d'avance persuadé qu'il va en éprouver, on pourroit attribuer ces effets à l'imagination.

"Cependant l'incrédulité absolue du magnétisé peut repousser l'action du magnétiseur, la contrarier, la retarder, et s'opposer aux effets pour un temps plus ou moins long.

"C'est une des raisons pour lesquelles on agit bien plus sûrement sur des gens de la campagne que sur des hommes du monde, qui veulent seulement se prêter à une expérience. C'est aussi pourquoi il est de la prudence de ne proposer l'essai du magnétisme qu'à des personnes qui sont dans un état assez souffrant pour qu'en essayant, sans y croire, elles s'abandonnent avec le désir que le moyen qu'on leur propose ne soit pas une chimère.

"Parmi les hommes absolument incrédules que j'ai tenté de magnétiser, j'en ai rencontré plusieurs sur qui je ne pouvois produire aucun effet. Peut-être cela tenoit-il à ce que la crainte de ne pas réussir troubloit ma confiance, détournoit mon attention, et empêchoit l'exercice naturel de ma volonté; mais peut-être aussi l'incrédulité du malade repoussoit-elle mon action." P. 134.

"Suivez l'histoire du magnétisme, consultez les magnétiseurs expérimentés, et vous verrez qu'ils se sont toujours repentis d'avoir montré des phénomènes extraordinaires à des personnes qui n'étoient pas déjà convaincues." P. 76.

[x] "Evitez surtout de magnétiser des femmes qui ont seulement une incommodité légère, et des personnes qui veulent essayer du magnétisme par curiosité et pour savoir si elles sentiront quelque chose." P. 69.

Among the magnetizers it is still a question whether their faith is preceded by their will, or their will by their faith. Deleuze is of opinion that his faith was preceded by his will[y]: but the truth seems to be, that if faith and the will in such cases be not in the habit of coming together, or at scarcely any discernible distance, there would be no cause for dispute.

Persons who are much addicted to study, who are well-informed, who have acquired a high reputation, or who have adopted a system of opinions, experience great difficulties in becoming magnetizers, but when they become so, are found the most steady supporters of magnetism, and the best qualified to state the phenomena which it exhibits, without the contaminations of error. Those most apt to become magnetizers are generally persons of moderate acquirements, plain men, strangers to systems, and of no pretension[z]: such likewise are the persons most apt to be magnetized; and therefore magnetizers have found the country to be a scene much better calculated for their experiments than populous cities[a].

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[y] "On a présenté la croyance comme une qualité préliminaire ; on a même réduit les préceptes à ces deux mots, *croyez et veuillez*. Cela n'est pas exact.

"D'abord, ce n'est pas *croyez et veuillez*, mais *veuillez et croyez* qu'il eût fallu dire. La volonté est indispensable, puisqu'on ne fait usage de ses facultés qu'autant qu'on le veut. Mais il y a mille exemples de gens qui ont produit des effets avant de croire. S'il en étoit autrement, un incrédule ne pourroit jamais se convaincre par sa propre expérience." P. 71.

[z] "Ajoutez que les hommes livrés à l'étude des sciences, et surtout ceux qui ont acquis une grande réputation, éprouvent de l'éloignement à examiner des faits qui leur paroissent contraires aux opinions reçues. Ils craignent de passer pour dupes et de se compromettre : cela ne les détourneroit pas de rendre témoignage à la vérité; mais cela les rend extrêmement défians,

All magnetizers are not equally successful, and Deleuze seems to think that the cause may be explained from certain differences in the force of

et les empêche d'apporter, dans l'observation des phénomènes qui s'opposent à leurs idées, les dispositions nécessaires pour les bien voir. En général, les hommes instruits, les savans surtout, deviennent plus difficilement magnétiseurs; une fois convaincus, ils sont les plus fermes apôtres de la vérité, et très-propres à la présenter dégagée de toutes les erreurs; mais le premier pas est pour eux très-difficile, parcequ'il leur en coûte beaucoup de faire abstraction de leurs idées et d'écouter simplement la nature, au lieu de faire des efforts pour ramener les phénomènes aux lois de la physique. C'est pourquoi on trouve plus de magnétiseurs parmi les hommes médiocrement instruits que parmi ceux qui se sont élevés à de hautes connoissances. Ces derniers craignent d'ailleurs de perdre du temps; et c'est avec peine qu'ils se déterminent à sacrifier quelques heures pour examiner ce qui leur est raconté par des hommes qui leur sont inférieurs en connoisances et en force de tête. Ce sont les gens simples, étrangers à tout esprit de système, d'un esprit droit et sans prétention, qui sont les plus disposés à adopter des vérités d'un ordre étranger à celles qu'ils connoissent déjà." P. 77.

[a] "Je vous ai dit que le séjour de la campagne étoit favorable au succès des expériences. Si vous êtes obligé de rester à la ville, alors ne faites l'essai du magnétisme que sur des personnes qui n'en ont pas entendu parler, qui ont de la confiance en vous, et qui ne sont pas d'un état assez supérieur au vôtre pour que vous soyez gêné avec elles. Si vous magnétisez quelqu'un qui vous observe, et dont l'opinion vous intéresse, la crainte de ne pas réussir troublera votre action, et il est probable que vous aurez peu de succès." P. 68.

the will; from the different directions which the will takes; from different degrees of capacity for attention; from a difference of belief, and consequently some difference of confidence in the remedy employed; from a difference also of benevolence and intention, and from a difference of physical constitution and state of health [b].

Magnetizers at present form three distinct schools; the school of Mesmer, the school of the Spiritualists, and the school of Puységur. The school of Mesmer ascribes the phenomena to a subtile fluid universally diffused; the school of the Spiritualists principally to the soul, or the soul alone; the school of Puységur, of which Deleuze professes to be one, to a physical action, in which the soul interposes by its will, assisted by certain practical arts learned from experience [c]. What all of them consider as the

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[b] " Je crois que les causes de cette différence viennent,

1° de la force de la volonté;

2° de la capacité d'attention;

3° de la direction de la volonté;

4° de la croyance;

5° de la confiance en sa puissance, qui est une suite de la croyance;

6° de la bienveillance et de l'intention;

7° de la constitution physique et de la santé." P. 127.

[c] " M. Mesmer admet l'existence d'un fluide universel, qui remplit l'espace, et qui est le moyen de communication entre tous les corps: il admet, comme Epicure, une matière subtile, des émanations, etc.

" Les spiritualistes croient que tous les phénomènes sont produits par l'âme, et que l'action physique est presque inutile.

" M. de Puységur reconnoît une action physique, dans la-most wonderful effect of their art, is the state of somnambulism to which they occasionally reduce their patients; and yet their somnambulists, according to Deleuze, differ in nothing from natural somnambulists, except that the somnambulists who are magnetized submit to be directed by their magnetizers, while the natural somnambulist cannot be directed by another person[d].

Now, suppose that Deleuze is the faithful historian that he seems to be, and that his statements of the several phenomena of animal magnetism are perfectly correct, do they establish any general fact with which we were not previously acquainted? Have not most of us felt, when there was nothing to arrest our attention but the most insignificant nods and shrugs, the waving of hands, or the tiresome, drawling, monotonous tones of an uninteresting long-winded orator, that we have irresistibly been compelled to sleep? Might we not have learned from daily experience, that the voluntary motions of our own bodies are under the direction of some vital principle within us? and that this principle and our voluntary motions

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quelle l'âme intervient par la puissance de la volonté, et par des pratiques que l'expérience seule nous a fait connoître.

"Je ne prétends point décider entre ces trois écoles; mais, s'il faut dire mon sentiment, j'avoue que je me range au nombre des disciples de M. de Puységur." P. 95, 96, 97.

[d] "La seule différence entre les somnambules naturels et les somnambules magnétiques, c'est que ces derniers sont dirigés, et que les autres ne le sont pas." P. 169.

may also be brought under subjection to another principle of the same species? Do we not see the voluntary motions not only of one or two, but even of thousands in fleets and armies, in a great measure regulated by the will of one individual? Have we not observed that *will* communicated to those thousands almost instantaneously by a word, by a sound, or a visible sign, and afterwards operating through their hopes, their fears, their astonishment, or despair, so as to affect their thoughts while awake, and to create in them dreams while asleep? But such daily proofs of the general fact are seldom appealed to; they want novelty to attract the attention, and therefore the person who has not something novel in his manner, if he wishes to be listened to upon the subject, must appeal to something not of daily occurrence, but to something like that mental contagion which spread so rapidly through the hospital at Haerlem, and which, from the sight of a single individual falling into fits, diffused itself in the form of epilepsy through most of the young persons in the house, and was afterwards as suddenly checked by Boerhave, without employing any other means than that of inspiring the patients with the dread of much greater horrors, if they ever again submitted to such fits: or he must appeal to those cases where enthusiatic leaders of sects, Christian and heathen, have thrown their hearers into convulsions, and who, during their convulsions, have dreamed dreams, and made themselves believe that they saw visions; or to such as that singular mental influenza, the greatest certainly in its extent, duration, and consequences of any recorded in the pages of history, namely, that influenza which was induced by Peter the hermit, who preached the crusades, and effected his purposes by carrying about him and showing a letter which he pretended was written in heaven, and addressed to Christians of all denominations [e].

Cowper, whose mind was exquisitely sensitive, and who, like every poet of nature, was often under the influence of fancy, and well acquainted with its operations, has thus observed, in alluding to himself:

Me oft has Fancy ludicrous and wild
Sooth'd with a waking dream of houses, tow'rs,
Trees, churches, and strange visages express'd
In the red cinders, while with poring eye
I gaz'd, myself creating what I saw [f].

Another poet of extreme sensibility, and who, like Cowper, has often experienced how irresistibly the most trifling incidents may affect the soul, and unhinge the whole frame of the body, has happily said, with his usual feeling and energy of expression:

And slight withal may be the things which bring
Back to the heart the weight which it would fling
Aside for ever: it may be a sound,
A tone of music, summer's eve, or spring,

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[e] See Mosheim's Ecclesiastical History, translated by Maclaine, vol. i. p. 232. Lond. 1774, 5 vols. 8vo.

[f] The Task, book iv.

A flower, the wind, the ocean, which shall wound,
Striking the electric chain wherewith we are darkly bound;
And how and why we know not, nor can trace
Home to its cloud this lightning of the mind[g].

Agreeably to these sentiments of the poets, a dispassionate philosopher has observed that " one curl sometimes, like a screw, will work its way into heart of oak. A lock of hair will draw more than a cable-rope; and a love-hood will catch fancies a hundred times faster than a cob-web does flies. A word, a look, a tread, will sometimes do it, as they are appendents to external symmetry, or indications of the beauty of the mind[h]." The same philosopher has also remarked, " if the eye be so rare an engine as to see all that light can represent to it, how excellent a faculty of the mind is fancy ! that can see without light, can hear without sound, and imitate all the other senses without the use of the organs of sense, can at once perceive what the senses perceive, distinctly and at several times, can travel through the world while we sit still, and drawing a landscape of the several countries, persons, and things, seen or heard of by us, in their proper time and place, let it all into its little dark room : all which is actually done in common discourse[i]."

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[g] Childe Harold, canto iv. st. 23.

[h] Grew's *Cosmologia Sacra, or a Discourse of the Universe,* p. 64. Lond. 1701, fol.

[i] Ibid. p. 47.

SECTION VII.

OPINIONS OF GREW.

GREW, a physician, anatomist, naturalist, and physiologist, not more distinguished by the variety of his information, than by his comprehensive and original views, supposes two worlds, a vital and corporeal; the former containing those species of substances which are capable of exhibiting the phenomena of life; the latter, on the other hand, containing those species of substances which are destined to exhibit the phenomena of motion[k];

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[k] "The universe consisteth of the corporeal and the vital world: the latter of which is next to be considered. And first, I shall prove that there is a vital substance in nature, distinct from a body.

"The being hereof is possible, reasonable, and necessary. It is possible: that is, the supposing of an incorporeal substance inferreth no contradiction, because God, who, as he is the cause of all other beings, is the most substantial being, is himself a substance vital and incorporeal; for to make God and with him all other things to be corporeal, is to make him no more than a limb of the whole, and is as much as to say that this limb or part of the whole made the whole; and in other respects is the greatest nonsense that can be spoken.

"Neither is it impossible but that this incorporeal substance may have some sort of existence analogous to corporeal extension, though we have no adequate conception hereof, nor therefore any proper word whereby to express it; for every motion is in some sort coextended with the body moved. Yet we cannot say that motion is thick or thin, or otherwise

In pursuing his hypothesis he generally, though not always, observes the distinction between life and a principle of life, or between the vital phenomena and their cause; and he no where employs the word organization to signify that which ought to be expressed either by the word structure or organism. Organization he invariably considers as a vital process, of which structure or organism is only the effect: he believes that every vital principle which

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great or small, as is a body; for if it were, then the same quantity of motion must always have the same extension, which it hath not; for all the motion in a great body may be given at once to a less. Nor can motion be said to be long or short, as a body; for then it would have a permanent, and not a successive length; and time and place would be the same thing.

"But whatsoever sort of existence it is which belongeth to a vital substance, our not having an adequate conception of it is no argument against the possibility of its being; for a worm or a man born blind can have no true conception of light. Is there therefore no such thing as light or colour? A fish that hath no ears can have no true conception of sound. Doth it therefore follow that there is no such thing as *music*?

"It may be said, that were there any such incorporeal substance, then, being one part of ourselves, we should know it better. But this doth not follow. All that we can infer from hence is only thus much, that as he who hath an eye knows what it is to see, so a man too, if possessed of a thinking substance, should know what it is to think: and so he doth. But there are millions who can see very well, and yet know not the structure of an eye; that is, in truth, they know not what an eye is. As therefore men may see without a true and adequate conception of an eye, so may we think without a true and adequate conception of the substance by which we think. So absurd it is to argue from our not comprehending to the non-being of things." Grew's *Cosmologia Sacra*, p. 31.

constructs an organism is limited to certain specific processes of organization; that the organism constructed may be suited to the faculties with which it is endowed, and to the circumstances in which it is destined to exercise them[1]. Viewing life as an adjunct of vital principles, and motion as the adjunct of those which are corporeal, he thinks that through the medium of these two adjuncts there is what he terms an easy commerce between things corporeal and incorporeal; that corporeal impressions are transmitted by motion to the adjunct life, and by this adjunct to its vital substance; and *vice versa*, that vital impressions are transmitted to body by its adjunct motion; whence arises, he thinks, the conformity between the impressions of the mind and the motions of the body[m].

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[1] "Wherefore the organism of a body, although it hath nothing to do in the production of life, as hath been shewed, yet is it necessary that every body should have its organism, agreeable to the species of life in the vital principle wherewith it is endowed, so as hereby to be fitted to receive from and transfer unto life all manner of proper motions and impressions; life and motion being, as is said, the two instruments of commerce between the vital and the corporeal worlds." P. 34.

This language of Grew cannot be interpreted as affording any encouragement to those who pretend to know what the character of any individual is or has been, merely from the appearance of his skull or bust, or from the size, form, or weight of his brain. Much depends upon the original energies of the soul, on concealed organisms, on the degrees of irritability, upon internal and external impressions, and upon the modes and the times in which they are made. Craniologists and encephalologists, therefore, who are fully aware of these circumstances, should not appeal to them merely when required to explain how their conjectures and predictions have failed, but should appeal to them on all occasions as grounds and reasons why no conjecture should ever be formed, and no prediction whatever attempted upon such data.

In treating of these adjuncts he shows, at great length, that the adjunct life cannot possibly be an adjunct of body, in any state or under any form, and thinks that neither this adjunct nor even its subject can be a principle of motion, as in his opinion the universal stock of motion, like that of matter, can neither be increased nor diminished, but only transferred[n]. On what grounds he adopted his opinion concerning motion, he has no where explained; but if he knew not what the stock of motion belonging to the universe originally was, on what rational grounds could he assert that it has been neither increased nor diminished, but only transferred? Upon the supposition that it is only transferred, he ought to have shown whence man and other animals derive that motion which they communicate to their own organisms and to the external bodies around them. When he made this assertion, he certainly could not have imagined that motion any where remains at rest in a latent state. It would appear that after allowing his fancy to personify motion, he viewed it as a substance, instead of what he ought to have conceived it, the accidental state of a substance.

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[m] "What therefore motion is to all bodies, that life is, *suo modo*, to all the species of vital substance: by mediation of which two adjuncts, there is an easy commerce between things corporeal and incorporeal; that is to say, as all corporeal impressions are transmitted by motion unto life, and by life to vital substance, so, *vice versa*, all vital impressions are transmitted by motion unto body. And from hence arises the conformity between the impressions of the mind and the motions of the body." P. 34.

[n] "Yet neither by this life nor the subject of it do I mean a principle of motion; the universal stock of motion, as that of matter, being neither increased nor diminished, but only transferred: but I mean a certain power to determine the manner of its being transferred, or of returning an impression upon bodies suitable unto that which it receives; and, more especially, upon the principles of bodies, wherewith it seemeth chiefly to correspond." P. 35.

In treating of life as the common adjunct of all vital substances, Grew divides it, after the manner of the ancients, into three species, the vegetative, sensitive, and intellective[*]. In treading on this slippery ground however, he occasionally stumbles. Thus, while treating of his three species of vital adjuncts, he speaks of them sometimes as if they were actually three species of vital principles; nay at times employs expressions which might lead us to suppose, that occasionally he considered every vital principle as essentially the same substance, distinguished into genera and species merely by the genera and species of its adjuncts; a substance, in short, which, like the ὑλη πρωτη of the ancients, would without its adjuncts be utterly undefinable [p]. On the other hand, when not in the trammels of ancient metaphysics and dialectics, and when after demonstrating to his own satisfaction that there is no such thing as what he terms a corporeal vacuum between heaven and earth, nor a vital vacuum between God and man [q], he admits a number of separate and distinct vital essences, filling up the space between God and man, and composing two orders of being; one order including embodied essences, and the other including essences of abstracted mind[r]. But though one at first might be apt to imagine that he meant these two orders of essences to continue distinct, yet upon reflecting that his own species belonged to the lower order of the two, and naturally ambitious of rank and distinction for those of his kind, he thinks it not unreasonable to believe that those individuals of his own species, who shall be placed in any station of the future blessed life, " will, by orderly removes, be translated from one station to another; that being first advanced above their union with corporeal nature, and above the fantastic [sensitive nature] afterwards, they shall ascend at length unto that estate which enjoys the nearest station to the Deity; namely, that of abstracted intellectual minds[s]." By the adoption of this new hypothesis, Grew, though a serious and firm believer in the sacred records, virtually denies a permanent distinction between the two orders of essences; nay denies even the immortality of any future body with which the human soul may be invested; as the human soul, upon this supposition, must lay aside every thing corporeal, of however fine a texture, be it air or æther, before it can be numbered with the pure essences of abstracted mind.

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[*] "Now the several species of life seem to be reducible unto these three, viz. vegetable life, sense, and thought." P. 34.

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[p] "As body is the proper and immediate subject of any species of motion, so there ought to be such a substantial principle as may be the proper and immediate subject not of one only but of any species of life." P. 34.

[q] "The existence of other beings, superior unto human mind, is further evident from the plenitude of things, so far as we are able to go throughout the visible world. A glass that is emptied of liquor will be filled with air; if of air, with a mixed ether; for we can see any thing placed in the aerial vacuum, and with scales can see it gravitate, and if water, see it freeze; which we could not do, were there not a free access of those bodies which are the causes of light, weight, and cold. So also the pores of bodies and the intervals between the several mundane orbs are all filled with diverse fluids, one within and more subtile than another. And what can be more reasonable than that there should be the same agreeable plenitude in the invisible world? We may then as well suppose a corporeal vacuum between heaven and earth, as a vital between God and man." P. 79.

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[r] " It cannot possibly be that there should be any disproportion in the works of God. But there would have been no proportion, for God to have bestowed more art and multiplicity of wisdom on the corporeal world, which is the meaner, than on the vital, which is the more excellent; or on that half of vital nature which is below the mind of man, than on the nobler moiety which is above it: so that we are to look upon man as the equator of the universe.

" We may hence also gather, wherein the diversity of superior beings doth consist: that with respect to their essences they are of two general orders; the one of embodied, the other of abstracted mind." P. 80.

[s] P. 120.

Such are the leading sentiments of Grew concerning life and organization; and although he owes more of his fame to his celebrated work, *The Anatomy of Plants*, than to his *Cosmologia Sacra*, yet the latter, notwithstanding some errors and inconsistencies, contains a variety of curious and valuable information, interesting not only to the naturalist, anatomist, and physiologist, but to the divine and the politician. The style indeed has in some measure become obsolete, but is throughout perspicuous and forcible; the illustrations are numerous, varied, short, and apposite; the observations generally acute, accurate, and striking, while among them there are several which, borrowed or repeated by succeeding writers, have, upon the supposition that they were new, been deemed of no inconsiderable importance.

SECTION VIII.

SUMMARY VIEW.

From the preceding inquiry we learn that all physiological writers ancient and modern seem to be agreed, that the causes of life and organization are utterly invisible, whether they pass under the name of animating principles, vital principles, indivisible atoms, spermatic powers, organic particles, organic germs, formative appetencies, formative propensities, formative forces, formative nisuses, preexisting monads, semina rerum, plastic natures, occult qualities, or certain unknown chemical affinities. All seem agreed that whatever they be, they have been operating since the world began, and throughout the world operating regularly without intermission in various places at the same time. All seem agreed that their modes of operation are strictly methodical, that they seem to act on definite plans, and actually exhibit specific varieties of chemical combination and mechanical structure, which human intelligence cannot comprehend, much less explain. From their mutual dependence and other relations subsisting between them, all seem to speak as if they were subjected to one great cause which regulates and harmonizes the whole. All seem to speak of this great cause as if it were eternal, omnipotent, omnipresent; whether it be the element of fire, of air, or of water, or whether it be fate, nature, necessity, or a god. All seem agreed, that wherever the human race has been found, whether civilized, barbarous, or savage, there is a general impression on the mind that their animating principles, with new bodies, are to exist in a future state, and in that state to be more or less happy, according to the deeds of the present life. It is obvious that to this general impression we owe many of the previous hypotheses concerning the invisible causes of life and organization. Under its influence the feelings naturally become interested, frequently interpose a paramount authority, and dictate the conclusions which reason and judgment in submissive obedience are compelled to adopt. No writer, not even the atheist, presumes to deny the general impression; yet somehow or other, from feeling uneasy under its influence, many try to resist it, and even to efface it, flatter themselves with the idea that it has no rational foundation, and that it has probably originated with knaves, been propagated by fools, and continued to serve the purposes of priests and of politicians. If any one say, that it may possibly have originated in instinct, they ask, what is instinct? they ask if instinct can furnish them with reasons. If it has not reasons, in their opinion it ought to be despised, and no more regarded than an old woman's fable, or any silly story that rests upon the evidence of ancient tradition. If it be insinuated that even they themselves may possibly have an animating principle that is to be responsible in a future state, they ask, where is it? they desire you to show it, seemingly determined not to be convinced of its existence until they see it or handle it in a separate state. Is it fire? they will say; is it air, or water, or any of the gases? is it a thing that may be analysed? or is it a thing that refuses to abide the test of experiment? If they be told that it is a substance, and like every other substance, to be known and distinguished by its effects, they will ask again, what are those effects? If answered that their bodily structure is one of them, that an animating substance seems to be the cause which regulates the number, the forms, the varieties, the positions, the connexions, and the relative proportions of their bones, their joints, their ligaments, their muscles, their brain, their nerves, their organs of digestion, circulation, nutrition, their organs of hearing, seeing, tasting, touching, and smelling; that it is also the cause which operates through the medium of these organs, the cause to which they must ultimately refer their feelings and their thoughts, their reasonings, and their speech; if asked to mention any other cause to which they can ascribe their organization and the concomitant phenomena of life, they cannot reply that their organism and every such organism may be constructed, and all their various phenomena explained, by invisible atoms, abstract forces, occult qualities, or certain unknown chemical affinities, without the most obvious and glaring inconsistency, nay, without the most shameless and contemptible shuffling; for if they be convinced that they ought not to admit the existence of any thing which cannot be seen, handled, or examined in a separate state, what proof can they bring that either they or any one else ever beheld in a separate state an invisible atom, an abstract power, an occult quality, or a chemical affinity?

With the like inconsistency they argue against the existence of a deity possessed of intelligence and moral attributes. Such a deity, they say, has never condescended to appear in their presence, to render himself an object of their senses, to become the subject of their experiments, and to furnish them with the evidence which they require of his power, his wisdom, his knowledge, and his right to govern the universe. On these accounts they choose to devolve the charge of the universe on certain creatures of their own appointment, which they term Nature, Fate, Necessity, and which they invest with what they conceive appropriate attributes for such an office, as omnipresence and omnipotent power, but withhold every kind of intelligence and moral attributes, lest they should abuse them. At the same time, that these their agents may the better be enabled to act with at least the appearance of design, wisdom, equity, and foresight, they expect them to observe certain eternal and immutable laws; laws which certainly are unique in their kind, sometimes represented as self-existent, and consequently antecedent to all legislative authority, sometimes as the laws which properly constitute Fate and Necessity, sometimes as the laws which are the enactments of Fate and Necessity, sometimes as the laws by which Nature is governed, sometimes as the laws by which Nature governs, sometimes as the laws which originate in the properties of matter, and sometimes as the laws in which the properties of matter originate. After thus entrusting the affairs of the universe to such agents and to such laws, they exultingly ask, where is there any occasion for the God whom priests and tyrants would impose upon mankind? If such a God wishes to be known as an object either of love or of gratitude, why, they say, does he not show himself to the world in a way less equivocal and more convincing than by those revelations which seem to accuse him of partiality? if infinitely good, why fear him? if infinitely wise, why trouble ourselves about our lot? if he knows all things, why inform him of our wants, or why fatigue him with our prayers[t]? Such is a specimen of the reasoning and dogmatism contained in a work entitled *Le Vrai Sens du Systême de la Nature!!* With such writers it would be vain to enter into any rational discussion, as their inclinations dictate their conclusions, and their doubts constitute the articles of their creed. If any should ask, what pleasure can they have in propagating atheism with so much zeal? we can only reply in the language of the poet:

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[t] "Si Dieu veut être connu, chéri, remercié, que ne se montre-t-il à toute la terre d'une façon moins équivoque, plus capable de nous convaincre que ces révélations qui semblent l'accuser de partialite? - - - Si infiniment bon, pourquoi le craindre? Si infiniment sage, de quoi nous inquiéter sur notre sort? S'il sait tout, pourquoi l'avertir de nos besoins, et le fatiguer par nos prieres?" (*Le Vrai Sens du Systême de la Nature*, ch. 25.) See above, p. 412, note f.

> No wild enthusiast ever yet could rest,
> Till half mankind were like himself possess'd[u].

As there happen however to be different ways by which a person may relieve himself from the apprehension of a future judgment, either by disproving the existence of a deity of omnipotent power and moral attributes, or by disproving the immortality of the human soul, some who admit the existence of a deity of moral attributes, and even the existence of a rational soul, are yet averse from the idea that such a soul should be immortal. They observe that the progeny of a male and female must be a compound, not only as to form and structure, which is obvious in mules, mulattoes, and hybrids, but a compound also as to its vital or animating principle; and that, consequently, the soul being a compound must be ultimately dissolved and must perish with the structure which it inhabits. In order to meet this observation, some Christian divines admitting the conclusion that all compounds must ultimately be dissolved, have endeavoured to prove that the rational faculty is a soul by itself, without magnitude or supposable parts; and therefore has as good, if not a better claim to be thought imperishable, than the solid, minute, indivisible atoms of the pagan philosophers. But, unfortunately, their conclusion is not so conformable to their general principles as that of the pagan philosophers is to theirs. Leucippus, Democritus, and Epicurus invariably proceeded upon the hypothesis that the ultimate particles of matter are eternal, self-existent, independent, and, consequently, indestructible. Those Christian divines, on the other hand, who believe that the ultimate particles of matter and the souls of men were created by the Deity, and that their existence, be they simple or compound, is dependent on his will, must renounce their own creed, adopt the pagan, and argue like heathens, before they can proceed upon the hypothesis that the soul must be immortal, because uncompounded, or because immaterial. On these accounts can they possibly imagine that the soul's existence becomes independent on the will of the Deity, who was pleased to create it, has been pleased to preserve it, and who, if he pleases, may continue to preserve it, even though a compound, throughout the periods of endless duration as easily as the most simple substance which he has been pleased to call into existence?

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[u] Cowper's Progress of Error.

On reviewing the opinions which have been examined in the preceding inquiry, the reader cannot fail to remark, that those physiologists who are inclined to favour materialism, rather decline than attempt to explain how the first parents of the different species of animals and plants might possibly have been formed. Their pretence is, that such inquiries might lead them into the regions of fancy[1]; a pretence however not to be credited, as it happens to be those physiologists themselves who have chiefly ransacked the regions of fancy, and who appear to have purposely ransacked them with no other view, than to find out causes which might enable them to account for life and organization without the interposition of a soul or a deity. Their real intention seems rather to have been, to avoid every species of inquiry that had the appearance of leading them to conclusions contrary to their wishes. They saw distinctly, that neither the division of plants and animals into different species nor the formation of their first parents could possibly be explained in any way, agreeably to their hypotheses: they saw distinctly that first parents could not be formed, either in the womb or in any other organ of a parent at a period when no parent existed: they saw distinctly the difficulty of accounting for two sexes in the same species: in short, they saw the insuperable difficulties which they had to encounter, if they allowed their fancies to ascend to the origin of things. To avoid so embarrassing a dilemma, they have chosen to assert that all events move in a circle, and that all the species of plants and animals may be eternal, imagining that by this contemptible subterfuge they may reasonably and plausibly evade the question, How came the first parents to be formed in a manner so different from that by which their progeny is formed now?

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[1] See above, p. 206.

The first writer who has thrown any light upon this subject is the prophet Moses, the lawgiver of the Jews; who, if not inspired, certainly writes like one who was inspired. He regularly assigns an adequate cause for the phenomena which he describes, not only for the orderly arrangement of the universe, but the first formation of the various species of animals and plants. The cause which he assigns is an omnipotent, omniscient, omnipresent being, invisible, self-existent, and eternal, and to whose will the whole material universe is subjected more thoroughly and completely, though not more inconceivably, than our bodily organisms are subjected to our wills. According to Moses, this supreme self-existent being did, in the beginning, create, by an act of his will, the heaven and the earth; created the earth first without form, and afterwards gave it form by causing his spirit to move upon the waters. In what way his spirit then acted on the waters, we certainly know not. We know that all the organisms of animals and plants are formed out of fluids, and that in a certain species of fluid secreted from the parent, and afterwards inclosed in a very thin and transparent vesicle, there is a living organizing principle which also acts upon the fluid in a way which we know not, forming out of it a regularly organized system of solids [y], and forming not only the rudiments of that system, but causing it afterwards to be nourished and to grow through the medium of fluids, which are moved and distributed under the influence of this organizing animating principle. The almighty creator, after thus giving a form to the earth, said, "Let there be light: and there was light;" and having separated the earth, or the dry land from the waters, he said, "Let the earth bring forth grass, the herb yielding seed, the fruit-tree yielding fruit after his kind, whose seed is in itself, upon the earth: and it was so." The earth and the waters being thus furnished with abundance of nourishment for fishes, birds, and other animals, the Almighty said, "Let the waters bring forth abundantly the moving creature that hath life, and fowl that may fly above the earth in the open firmament of heaven;" and also, "Let the earth bring forth the living creature after his kind, cattle, and creeping thing, and beast of the earth after his kind: and it was so." Thus "God made the beast of the earth after his kind, and cattle after their kind, and every thing that creepeth upon the earth after his kind." Lastly, he made man, and said, "Let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth, and over every creeping thing that creepeth upon the earth." By this delegated power conferred upon man, he in some measure became the image of God upon the earth, while in order to support the dignity of the station in which he was placed, he was endowed with the power of judging between what is morally right and wrong, with the faculty of reason, and with the capacity of tracing phenomena to invisible causes, and ultimately to him who is the cause of all other causes; the first and the last, the self-existent, the supreme in heaven and supreme on earth, the being who, in the opinion of Aristotle, could not possibly owe his existence to matter, though matter might derive its existence from him[1].

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[y] "Prima autem omnis formationis rudimenta contemplaturis occurrit ortus manifestus e fluidis, sine quibus nullam unquam organicam formam natura creavit." Curtii Sprengel *Institutiones Medicæ*, tom. i. p. 102.

In this succinct but sublime account of the creation, a rational and adequate cause is assigned for the first formation of animals and plants, for their division into different orders, genera, and species, and for the division of some of their species into two sexes. In this account we also observe a solution of the question which so long has puzzled atheists and materialists, Did the first egg proceed from a bird, or did the first bird proceed from an egg? According to Moses the first egg proceeded from a bird; and no prolific egg of the feathered tribe has ever yet been found, that was not the effect of the previous intercourse of two sexes. From the very first, the Deity formed all those species, male and female, which were to propagate through the medium of sexes; and having formed them perfect in their kind, in vigour and maturity, they were thus ready to obey the mandate, Be fruitful, and multiply, each after his kind; a mandate, not likely to be disregarded when proceeding from him at whose command the heavens and the earth, and all they contain, did in ready obedience start into existence. The mandate accordingly is in force at this day. Plants and animals propagate only after their kind, and after no other; mules and hybrids indicating by their form and by other characters that they are sprung from two distinct species or varieties. The same mandate, "Be fruitful, and multiply," was issued to man, and man, like other animals, has obeyed it: yet some men, naturally ambitious and unwilling to observe so many analogies between themselves and the lower animals, feel proud to mention that their first parents were formed in a manner different from that in which the first parents of any other species were originally formed. God, they say, breathed into the nostrils of their first parents the breath of life; a circumstance not mentioned of the first parents of any other species. But neither is it mentioned of the first parents of any other species than those of man, that they were created male and female. Are we thence to infer that man is the only species of animal that exhibits the phenomenon of two sexes? Let those men, ambitious of distinction, be as proud as they choose. According to Moses, every species of animal and plant participates as well as they, in the honour of having been formed, preserved, and continued, by the will, the wisdom, and power of the Deity. Nor let man envy the honour thus bestowed on his fellow creatures. He has obtained the dominion over them: so let those who are conscious of this marked distinction, who are capable of tracing the origin of their species to the first of causes, and who feel that they are under the protection of an omnipotent, omniscient, omnipresent being, self-existent, benevolent, and just, be therewith content, and congratulate themselves that they are not reduced to that low and degraded state of some modern physiologists, who with all their efforts have never been able to trace their origin beyond some gross collections of matter, some occult qualities, or some unknown chemical affinities of mud or atoms; and who, as to religion, have only to console themselves with the thought, that they are at least as far advanced as the Caffres, the Hottentots, and the untutored savages of Brazil [a].

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[1] See above, p. 429.

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[a] See above, p. 410.

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Blumenbach, 288. Plants and animals organized by a formative Nisus. The Nisus the effect of an occult quality. Depends on the powers of life. Is an action gradually induced upon matter. Is a property of the living principle itself.

Bodies, organized, found in three states, the living, torpid, and dead; 1. Supposed to have been all organized at the same time, and, until developed, supposed invisible. In their invisible state called *corpora genitalia, semina rerum*. Organic germs, living organic particles, monads, 52, 85, 153, 168, 171, 178, n.; 188, 189, 195, 196. Supposed to have been organized at different periods, and in different ways. See ORGANIZATION.

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C

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D

Darwin, 143. Organized bodies neither eternal nor created, but generated. No pre-existing germs. Plants and animals originate in filaments that have certain capabilities of irritation, sensation, volition, and which acquire new irritations, sensations, volitions, by every new accretion or organization. All varieties of organized bodies may have originated in the same kind of filament.

Democritus, 43. His three principles, matter, motion, and a vacuum, 34, n. They never produce a palace or a temple, or any thing resembling the works of art.

Des Cartes, 392. The lower animals are mere machines; and without feeling, instinct, or reason, move and act on mechanical principles.

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E

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Fray, 126. All substances, whether gaseous, liquid, or solid, have originally proceeded from the rays of the sun. Atoms thus derived, when assisted by Nature, Fate, and Necessity, produce organized structures. These structures acquire motion, sensation, volition. Atoms also, by concentrating their forces, form an eternal principle of organization, of life, of motion, and of metamorphosis. The atoms thus organize a deity, which deity in his turn organizes the atoms.

Gassendi, 312. A great admirer of Epicurus, but believes, in opposition to Epicurus, that God created the world, that he governs the world, and that the souls of men are immortal. Adopts the atomical philosophy of Bacon, rather than that of Epicurus. Supposes that a principal object with Epicurus was to improve the system of

Ethics. Ridicules the idea of living matter. Thinks that life may originate in mechanism.

G

Grew, 511. Two worlds, a visible and an invisible. The substances of the visible world distinguished by the adjunct motion. The substances of the invisible world by the adjunct life. The invisible world contains various species of animating substances. These substances the causes of organization. Each forms a structure suited to its faculties. The stock of motion in the universe neither increased nor diminished, but transferred.

H

Haller, 188. Adopts the hypothesis of involution.

Harvey, 440. Ascribes organization to an animating principle. Makes this principle to reside in the blood. Next supposes the blood to be the animating principle. Makes the blood to derive its animation from its *calidum innatum*, and then supposes the *calidum innatum* to be the animating principle. His discovery of the circulation led to the practice of transfusing blood from one animal into another.

Hume. His idea of instinct, 280. Of power, force, energy, and necessary connexion, 311. Finds fault with those philosophers who say that every thing is full of God, that nothing exists but by his will, and that nothing possesses power but by his concession. Thinks it unfair thus to *rob nature and created beings* of every power, in order to render their dependence on the Deity still more sensible and immediate, 317, n.; see p. 170. His idea of necessary connexion unguardedly adopted by Mr. Lawrence, 344.

Hunter, John, 475. A living principle organizes the body. Resides in the blood as well as in the solids. Is a *materia vitæ* of the same nature as the substance of the brain. Mere composition of matter does not give life. Life is a property we do not understand.

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K

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L

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Laws of Nature, 76, 523.

Leibnitz, 153. There are certain substances distinct from matter, which may be termed souls or entelecheias, primitive forces, substantial substances, simple substances, or monads. These substances are naturally imperishable. All monads, excepting the Deity, are created; and all, excepting the Deity, are invested with bodies. Monads have no influence over their bodies, nor the bodies any influence over their monads. The monads and their bodies co-operate, and are developed by a pre-established order of harmony. All monads have a tendency to rise through a scale of gradation to a higher rank. The monads, together with their bodies, are somewhat analogous to the germs of Swammerdam, Hartsoeker, Leeuwenhoek. The word monad signifies sometimes the entelecheia, sometimes the body of the entelecheia, and sometimes both.

Life only from life, 55, n.; 318, n. Life the cause of death, 335, n. 431. Death the cause of life, 335, n. Life a vague term, sometimes signifies an animating principle, sometimes the phenomena which indicate that principle. See ANIMA.

Locke gives no countenance to the hypothesis that all our ideas are derived from sensation, as the French philosophers seem not only anxious to insinuate, but even to assert, 356, &c.

Lower, 457. Claims the merit of being the first who transfused the blood of one animal into another. Consequences anticipated from the transfusion, 458, 460.

Lucretius, 45. All phenomena may be traced ultimately to invisible atoms. Nature operates by invisible atoms. Animals formed by

showers and sunshine out of the mud. All spring from the earth, which is justly entitled to the name of mother. The earth being now old and effete cannot produce them so abundantly as formerly. In her first attempts to produce animals, she produced monsters. Nature was obliged to interfere. Necessity regulates the operations of Nature. Plants, animals, and their vital principles, grow from specific seeds. These seeds act by a *secreta facultas*, or occult quality. This *secreta facultas* is without a name. There can be no mutual action between things corporeal and incorporeal. What the gods know, they must have learned from Nature, 84. Nature and the world seem to be in their infancy, from the small progress of the arts and sciences. No future state. The particles of which the soul is composed separate at death. Religion the cause of many evils and enormous crimes. Epicurus admired for having trampled religion under foot, and relieved mankind from the dread of the gods, of a future state, and the tyranny of priests.

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Maupertuis, 246. Seminal fluids are extracts from all parts of the body; their particles may operate by chemical affinities or by instincts; may be endowed with a species of intelligence, desire, aversion, and memory. The living principle, the concentrated energies of these particles. Religion and philosophy being of different orders, cannot interfere. Like other materialists, Maupertuis makes a more unconscionable demand upon our credulity than the most abject votaries of superstition.

Milton quoted, 230.

More, Henry, quoted, 439.

Morgan, Sir Thomas Charles. Living function depends on organized matter, and organized matter on living function. Seems to think with the vulgar, that what is not religion must be philosophy, 385, 386.

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Needham, 222. Denies the pre-existence of germs. Maintains the existence of resisting, expansive, penetrating, and vegetative forces. Supposes them to act under the direction and influence of the Deity. Thinks that matter may be first organized, and then *vitalized*, until it arrive at the most perfect degree of animal vitality. Confounds physical and metaphysical reasoning. Occasionally mistakes ideal entities for real substances. An ingenious and learned, but not a perspicuous writer.

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O

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P

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Plato, 8, n. 436.

Polignac, Cardinal, 150, 403.

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Robinet, J. B. 262. All matter, living, organic, animal. All has a tendency to become active and *dematerialized* into pure intelligence. The great object of nature to make man She learned to make him after performing numerous experiments. At first she made minerals resembling parts of him: in joining these parts, she at first produced monsters. Nature is only a single act, which comprehends past, present, and future. A visible world and an invisible.

S

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